ADDENDUM A - OEM Parts and Maintenance Manual

8 1/2" X 11" PAGES
24 X 98 PAGE FORMAT

COLOR STRIPE REQUIRED = TANGERINE (52567)

Northern Micrographics
P.O. Box 2287
2004 Kramer Street
La Crosse, WI 54601 Phone 608-781-0850

Harnischfeger
P&H

9 / 94
Rev 1

REPLACEMENT PARTS MANUAL
Overhead Traveling Crane
Serial number CI-29638

Fiche 1 of 3
Part
Book

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4/92

Rev 0

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Serial Number CI-29638

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A B C D E F G

1 2 3 4 5 6 7 8 9 10 11 12 13 14

OVERHEAD TRAVELING CRANE

PARTS MANUAL FOR LOUISVILLE AND JEFFERSON COUNTY

SERIAL NUMBER CI-29638

DATE: JUNE 9, 1988

8 COPIES OF REPLACEMENT PARTS MANUALS ARE ENCLOSED FOR THE FOLLOWING

SHIPPING ADDRESS FOR PARTS MANUALS:

LOUISVILLE AND JEFFERSON COUNTY RIVERPORT AUTHORITY 6219 CANE RUN RD. LOUISVILLE, KY 40258 ATTN: LARRY D. MC FALL V.P.

SHIPPING ADDRESS FOR CRANE:

LOUISVILLE AND JEFFERSON COUNTY RIVERPORT AUTHORITY 6900 RIVERPORT RD. LOUISVILLE, KY 40258

PURCHASERS ORDER NO. SIGNED AGREEMENT

HOIST TYPE: H-703	CAPACITY: 30 TON	LIFT: 66'-0"
TROLLEY TYPE: D-153	SPREAD: 13'-0"	TROLLEY RAIL: 60#
BRIDGE DRIVE: D-153	SPAN: 70'- 0"	RUNWAY RAIL:175#/YD.
VOLTAGE: 460	PHASE: 3	CYCLE: 60
MOTORS: P&H	CONTROL: P&H BULL. 562/563N STATIC STEPLESS	

CC: SERVICE - MAIN PLANT - 1 BOOK
DEALER - 1 BOOK - M.P.H.
DUX DALLAS - I COPY1 COPY
SCHMIDT - CINCINNATI - 1 COPY

HARNISCHFEGER

TECHNICAL PUBLICATIONS

P.A.K.

OVERHEAD AND POWERMAST CRANES

PRICING — TAX — INVOICING — SHIPPING — LOADING — DATA

Customer I.D. #355383

SOLD TO Louisville and Jefferson County
Riverport Authority
6219 Cane Run Road
Louisville, KY 40258

INVOICE Louisville and Jefferson County
Riverport Authority
P. O. Box 58010
Louisville, KY 40258
Attn: Larry D. McFall, PE
Also see below

SHIP TO Louisville and Jefferson County
Riverport Authority
6900 Riverport Road
Louisville, KY 40258

CRANE NO. CI-29638 SCE
PROPOSAL NO. 89083-207
PROPOSAL DATE 10/2/87
RELEASE DATE 10-30-87
FINAL DATE 2/22/88
ERECTED BY P&H

TAX INFORMATION

EXEMPTION NO. Exempt
ADD TO INVOICE
REF CUSTOMER ORDER

PRICING INFORMATION

FIRM Yes
ESCALATION FORM
POSTING DATE

F.O.B. Louisville, Kentucky
SHIP VIA Truck
REMARKS PENALTY JOB
Send copy of invoice to:
Mr. Robert O. Grubbs, P.E.
Hazelet & Erdal Inc.
304 West Liberty Street
Louisville, KY 40202-3004

FREIGHT Prepay & Allow
TERMS 10/25/35/10/20 - See Attached Sheet

FCE(2/26/88)-install mainline.
SCE(6/1/88)-storage charges added
ship to: revised

SCHEDULED SHIPMENT June, 1988

EST ERECTION DATA (AS ENGINEERED)	(ESTIMATED)	(AS ENGINEERED) WEIGHT (LBS.)
FRONT GIRDER	17,000	19,715
MACHINERY	4,000	5,670
WALKWAY	4,200	4,490
CONTROL	5,100	8,800
CONDUCTORS		
TOTAL FRONT GIRDER	30,300	38,675
REAR GIRDER	17,000	19,715
WALKWAY	1,100	1,440
CONDUCTORS	1,800	1,800
TOTAL REAR GIRDER	19,900	22,955
TROLLEY	28,000	30,000
RIGID MAST		
INTERMEDIATE MAST		
CARRIAGE COMPLETE		
CAB w/Mtg.	3,800	3,200
END TIES		
2 END TRUCKS	12,400	13,995
AUX GIRDERS		
M/L CAGE w/ Mtg.	500	750
MISCELLANEOUS	8,500	3,500
TOTAL NET WGT	103,400	113,095
TOTAL SHPG WGT	107,000	117,030

PRICING	
CUST. ORDER NO.	ITEM
Signed Agreement	CRANE CI-29638
	S1 RUNWAY CONDUCTORS
	S2 SPARES
	CHECKOUT SERVICE
	FREIGHT
USERS LIST EN 503 EN 526 EN 524	SUBTOTAL CONTRACT PRICE
	STATE USE TAX
EN 528 EN 550	LOCAL USE TAX
EN 543 EN 549	ERECTION AND OR SERVICE ENGINEER
	GRAND TOTAL

REPRESENTATIVE - DISTRICT	NO.
Dux - Dallas Schmidt - Cincinnati	

CRANE WHEEL LOADING 64,400 LBS AT 17'-10 5/8"

IS TROLLEY KNOCKED DOWN FOR SHIPMENT ? NO

CRANE CODE	CRANE NO.
010-850	CI-29638 SCE

FORM 2265-2 REV. 1/84

OVERHEAD CRANE ORDER DATA

MAILING ADDRESS
P.O. BOX 310
MILWAUKEE, WI. 53201
PHONE: 414-671-4400
CABLE: HARNINCO
TELEX: 26-724
ANSWERBACK: HARNCO H WMIL

Harnischfeger P&H

SOLD TO Louisville and Jefferson County Riverport Authority

USER Louisville and Jefferson County Riverport Authority

PLANT SITE Louisville, Kentucky

DATE October 30, 1987
CRANE NO. CI-29638
PROPOSAL NO. 89083-207
SALES DESK DH
APPL.ENGR. RAH
ENGR SPECS RELEASED BY RAH

CUSTOMER INSPECTION REQUIRED? [X] YES [ ] NO [ ] FULL

QUANTITY	CAPACITY	SPAN	SHIP. WEIGHT	CL. SKETCH	SERVICE
One	30 Ton	70'-0"	107,000#	30GB70	CMAA Class E Steel Coil & Coal Handling

TROLLEY

TYPE OF TROLLEY FRAME Welded Steel Sections

HOIST	CAPACITY	LIFT	DRUM DIA.	REEVING	BRAKING	HOIST TYPE
MAIN	30 Ton	66'-0" w/Bucket	21"	8 Parts 5/8" 4 Part Double	MAGNETORQUE 2408A	H-703

TROLLEY DRIVE		WHEELS	DIAMETER	NUMBER	TYPE	TROLLEY SPREAD
	D153/TW12		12"	4	60+	13'-0"

BRIDGE

TYPE OF SPAN CONDUCTORS Festooned Cables

ERECTION [X] P&H [ ] OTHER

			DIAMETER	NUMBER	TYPE
DRIVE TYPE	A4 (TW21)				
SPEED REDUCER	2 - D153	WHEELS	21"	4	60+
FRONT PLATFORM	Full Length Expanded Metal				
REAR PLATFORM	Short Expanded Metal	TYPE OF GIRDERS	Welded Steel Box Sections	TROLLEY RAIL(LBS)	60# w/Welded Clips

ELECTRICAL

POWER SUPPLY 460 VAC 3 Ø 60 HZ

MOTION	SPEED (FPM)	MOTOR DATA				MAKE AND TYPE	
		MFR.	FRAME	HP	RPM	BRAKES	LIMIT SWITCH
HOIST	90	P&H	HEW 587X	200	1200	P&H SBE 19" (2)	DB270 & Geared + Track L.S.
TROLLEY	150	P&H	HEW 324X	10	1200	P&H Disc	
BRIDGE	400	P&H	HEW 404X	(2)30	1200	P&H SBEM 10"(2)	BR & TR

MOTOR CONTROLS MAKE AND TYPE P&H Bulletin 562N/563N Static Stepless

LOCATION: [X] ON BRIDGE [ ] ON TROLLEY [ ] REMOTE

OPERATOR'S STATION: [ ] PULPIT [X] CAB [ ] RH; [ ] PENDANT [ ] OPEN [X] LH; [ ] RADIO [X] ENCL. [ ] CENTER

LOCATION: [X] ATTACHED TO BRIDGE [ ] ATTACHED TO TROLLEY

RUNWAY

RAIL SIZE(LBS/YD) 175 LENGTH 278'-1" Bumper Stop/Stop

[ ] INDOOR [X] OUTDOOR

COLLECTORS FURNISHED BY Double Shoe P&H

CONDUCTOR TYPE FURNISHED BY Saf-T-Bar or Equal 750 Amp P&H

RAIL-TO-ROOF Outdoor
RAIL-TO-FLOOR
PIT DEPTH

COMMENTS

Crane will handle coal with 16 cu. yd. electric/hydraulic clamshell bucket and coils with a C-hook (both by Purchaser).

SUPPLEMENTAL EQUIPMENT SUPPLIED

[X] RUNWAY CONDUCTORS
[ ] SPARES

CRANE NO. CI-29638

M

Harnischfeger Corporation

P&H

TERMS CI-29638

10% Upon approval of shop drawings.

25% When manufacturing of equipment is 50% complete.

35% When manufacturing of equipment is 100% complete and shop tested.

10% When equipment has been delivered to the Site.

20% When equipment has been installed and tested at the Site and finally accepted by the Owner. The work shall be inspected for acceptance by the Owner, promptly upon receipt of notice in writing that the work is ready for such inspection.

HARNISCHFEGER CORPORATION

CRANE SPECIFICATION

Louisville and Jefferson County
Riverport Authority
Louisville, Kentucky

P&H Crane No. CI-29638
February 22, 1988

1.0 GENERAL DESCRIPTION:

(1.1) SCOPE:

The following four part addenda constitutes a complete specification for a 30 ton capacity 4 motor, cab operated electric overhead traveling crane, designed for bucket service. Crane will consist of a 2 motor 30 ton capacity bridge and a 2 motor, 30 ton capacity trolley.

The crane will be designed for continuous outdoor service to handle bulk materials using an electro hydraulic clamshell bucket or to handle coil steel up to 30 tons. Crane to be designed for CMAA Class "E" service.

Crane will be designed and manufactured in accordance with P&H's interpretation of the following specifications and codes:

* CMAA #70
* Requirements for the State of Kentucky.
* OSHA - Including, but not limited to the following features:

A. Minimum of 30" working clearance will be provided in front of all electrical control enclosures.

B. A portable rubber mat will be provided for the footwalk, for servicing the electrical enclosures.

(1.2) PAINTING:

The crane and all components will be subjected to a marine and chemical environment and will be protected accordingly. Prior to coating, all exposed metal surfaces will be prepared in accordance with Steel Structure Painting Council SSPC-SP-6 Commercial Blast Cleaning, latest revision. All exposed metal surfaces will receive a prime coat, an intermediate coat and a top coat of yellow Epoxy-Polyamide paint, SSPC-PS Painting System Specification No. 13.01. The total minimum dry film thickness will not be less than 7.0 mils. This paint system will be used unless an alternate system is submitted for approval. All exposed machined surfaces will be coated with Houghton #342 Rust-Veto, or an approved equal.

(1.3) ASSEMBLY & SHOP TESTING:

Crane will be assembled, wired, and tested without externally applied load in our shops after which it will be suitably match-marked and dismantled to the extent required for shipment. Machined surfaces will be suitably protected against corrosion.

(1.4) DRAWINGS & PARTS BOOKS:

Provide two (2) complete sets of erection drawings and erection manuals before crane shipment to the customer and two (2) complete sets to the P&H Sub-Contract Erector. Eight (8) complete sets of parts books and Care and Operation Manuals will be provided for the customer.

(1.5) ERECTION & LOAD TEST:

Crane will be erected by P&H using a suitable Sub-Contractor with union labor. The services of a P&H Service Engineer will be provided to completely check out the crane. P&H Service Engineer to provide a minimum of 16 hours of instructions on the crane operation. P&H erection Sub-Contractor to load test the crane at 125% of rated load. Test weights by Purchaser. P&H erection Sub-Contractor to verify runway rail alignment with a visual inspection and check for obstructions.

(1.6) LUBRICATION:

Bearings that are not oil lubricated will be equipped with Alemite standard type hydraulic fittings located at the individual points. A suitable grease gun will be provided with crane.

Lubrication fittings on the upper load block, hoist drum pedestals, bridge and trolley wheel assemblies will be nested and serviceable from the front footwalk.

(1.7) DUTY CYCLE:

Crane duty cycle (see attachment) based on 10 second bucket closing time and 7 second discharge. The hoist must travel vertically approximately 10 feet to clear barge before bridge starts any movement in the duty cycle. The dimension from the hoist hook to bottom of clamshell bucket is assumed to be 13 feet. Crane will unload 1500 tons of coal from barge. Per customer's specification clamshell bucket will handle a 13.5 ton pay load and 16.5 tons weight of bucket.

2.0 STRUCTUAL DESCRIPTION:

(2.1) BRIDGE GIRDERS:

Bridge will be of the double girder design. Girders will be parellel flange welded box sections with full depth diaphragms. Girders will be cambered to compensate for dead and live load deflections per CMAA #70. Trolley rail will be continuous. Minimum plate thickness to be 5/16".

Trolley rails will be fastened to the girders by rail clips which will be welded to girder cover plates. Shear bars, located at rail ends, will eliminate rail creep. Drain holes will be provided in the bottom of the box girders to provide for drainage since the crane will operate outdoors.

(2.2) BRIDGE END TRUCKS:

Bridge end trucks will be welded box sections, reinforced with gusset plates and web stiffeners. Milled seats, arranged at right angles, will provide support for MCB bearing boxes, assuring positive alignment of bridge axle assemblies. Safety catches and drop bars will prevent trucks from leaving rails and from excessive drop in the event of axle failure. Crane will be a 4-wheel bridge design. Pads will be provided for use of jacks or wedges when changing truck wheels.

(2.3) FOOTWALK & HANDRAILS:

A full length structural platform will be provided on the drive side of the bridge. Platform will have expanded metal flooring, double member handrail, and a suitable toe guard.

Crane will be furnished with a double member handrail over end truck to give access to short rear platform.

(2.4) OPERATOR'S CAB:

Crane will be furnished with a sit-down type, structural steel cab complete with a steel ladder for access to footwalk. Mini-sized control masters will be arranged for shelf-mounting along the front of the cab. An electric warning bell, cab light, convenience outlet and four way adjustable padded seat will be provided. Cab will be located at the end of bridge. Provide a line of vision drawing for approval.

Cab will be enclosed type with the following features:

* Foot switch operated electric siren.
* Industrial duty self-contained air conditioner with minimum capacity of 10,000 BTU at 120°F.
* 4 KW electric blower heater.
* Nylon rope safety ladder.
* Dry chemical fire extinguisher.

* A 500 watt incandescent light fixture with shock absorbing socket attached to and controlled from the cab. The fixture will be mounted on a swivel bracket permitting directional alignment so as to project the light into the hopper. Light will be controlled by a switch in the cab.
* Light fixture and a convenience outlet.

(2.5) GUARDS:

All resistors will be completely guarded. Motor couplings will be provided with removable guards. A guard will be supported from the end truck to prevent hoisting cables from contacting main line conductors.

Rail sweeps will be furnished in front of all leading bridge and trolley wheels to clear rails of any obstructions.

3.0 MECHANICAL DESCRIPTION:

(3.1) GEARING:

Drives will have P&H alloy steel heat treated or high hardened gearing with 20° pressure angle and full fillet radius at the root. All gearing will be enclosed in gasketed gear cases designed to retain oil lubricants. Spring back oil seals will be used wherever possible. High speed gearing will be helical and low speed gearing will be spur. Gear boxes to be of fabricated steel.

(3.2) BEARINGS:

Bearings will be anti-friction throughout. All gear cases and wheel assemblies will be provided with self-aligning spherical roller bearings with a minimum B-10 bearing hour life of 40,000 hours.

(3.3) BRIDGE DRIVES:

Crane bridges will be furnished with an individual drive (CMAA Type A-4) arrangement, utilizing drive motors near each end of the bridge and connected to self-contained speed reducers. The speed reducers in turn will be connected through drive shafts directly to wheel axles. MCB rotating axle design will be furnished.

(3.4) COUPLINGS:

All motors will use geared type flexible couplings.

Floating shafts will have geared type, semi-flexible couplings.

(3.5) WHEELS:

Trolley and bridge wheel will be forged steel, 60+. All wheels will have straight treads.

(3.6) BUMPERS:

Trolley will be provided with double-acting spring bumpers.

Bridge end trucks will be provided with spring bumpers at all four corners. Bumpers will be designed to engage suitable stops, provided by Purchaser at runway ends.

(3.7) TROLLEY:

Crane will be furnished with a four wheel, unitized structural steel trolley complete with a two reduction built-up hoisting mechanism and a two reduction trolley drive.

A. Hoist Drum:

Right and left hand grooved, flanged, hoist drum will be supported by two self-aligning spherical roller bearings. Drum pitch diameter will be at least 30 times the rope diameter. Grooves will be depth hardened 1/8" to 450-500 BHN. Minimum depth of grooves to be 1/2 the diameter of the hoisting ropes.

B. Load Blocks:

Lower and upper load blocks will be of welded steel construction. The upper block assembly, consisting of sheave frame, bearings, and pin assembly, will be accessible from the top of the trolley deck. Block will be constructed such that the hook may be locked or fixed against rotation when operating with the electro hydraulic clamshell bucket. Lower block to have fixed crosshead and completely guarded.

C. Hook:

Fish hook will be of forged steel construction and will be provided with a safety latch. Submit hook drawings with safety latch so purchaser can design bail of electro hydraulic clamshell bucket.

D. Wire Rope:

Wire rope will be 6 x 37 extra improved plow steel. Rated capacity load plus weight of lower load block divided by the number of parts of rope will not exceed 20% of the rope's published breaking strength.

E. Sheaves:

Forged steel sheaves will be supported by roller bearings. Pitch diameter of running sheaves will be at least 30 times the rope diameter.

(3.8) MISCELLANEOUS:

Bridge will be provided with manual pin locks to tie down the bridge in parked position.

Bridge and trolley acceleration and deceleration shall be limited to 1.0 ft/sec/sec to minimize load swing.

Provide a suitable cage for servicing the mainline conductors (front girder).

4.0 ELECTRICAL DESCRIPTION:

(4.1) MOTORS:

P&H foot mounted, totally enclosed fan cooled ribbed frame, crane and hoist duty motors with anti-friction bearings will be used on all crane motions. Wound rotor motors with Class F insulation will be rated 120 minutes, 85°C rise by resistance, based on NEMA standards. Frame sizes will be selected to be equivalent to continuous motor ratings.

Motors will be provided with temperature detectors which activate high temperature warning lights. A seperate light will be provided for each motor. Motors to have heaters.

(4.2) BRAKES:

Hoist and trolley motors will be equipped with P&H spring-set, rectified DC magnetic brakes. The bridge motor(s) will have a P&H spring release. Each brake will be rated at a minimum of 125% of rated motor torque for hoist, and 100% for trolley. Hoist brake(s) will be a P&H AISE shoe type. Bridge brake(s) will have the torque capability to stop the crane within a distance in feet not to exceed 10% of rated full speed, in feet per minute, with capacity load.

OUTDOOR cranes will be provided with electric/hydraulic bridge motor brake(s) with electric feature used for parking.

Hoist to have two (2) brakes.

(4.3) CONTROL:

A. Bulletins 562N/563N P&H static stepless A.C. crane control will have the following features:

* Mainline disconnect switch will be a combination starter.
* P&H solenoid type magnetic contactors for reversing.
* Stepless speed regulation by saturable reactors and resistors.
* Control will include combination speed/torque running and torque control plugging protection.
* Thermal overload relays in 3 phases (O.S.H.A.).
* Power circuit fuses.
* Mainline contactor offering low voltage protection.
* 115 volt step down control transformer for reduced voltage to control masters (O.S.H.A.).
* Front wired panels.
* Modular construction of static components.
* NEMA 12 Enclosures.
* P&H Class 10-15 resistors hoist, 10-20 bridge and trolley, non-breakable and guarded.
* Magnetorque braking on hoist.
* Reversing plugging on bridge and trolley with plugging torque proportional to throw position of master switches or proportional to depression of pushbutton elements.
* Branch circuit protection. (O.S.H.A.)

* Bridge and trolley joystick.
* Control panels with strip heaters.
* A meter to record the accumulating hours of operation of the bridge crane. The meter will be activated when any motor operating the hoist, trolley or bridge is started and will continue to record until all motors are shut off.
* Auto deceleration by Eddy Current braking to minimize motor currents and brake wear.

(4.4) LIMIT SWITCHES:

A geared type limit switch will be used for hoist upper slow down and lower stop limits. P&H DB power circuit limit switch will be provided. Track type limit switches will be provided to slow down crane bridge and trolley at the ends of their travel to minimize impact on the end stops.

(4.5) LIGHTS:

Three (3), 400 watt sodium vapor lights will be mounted on crane bridge to illuminate the areas serviced by the hoist and bucket. Lights will be arranged for easy servicing through trap doors in the bridge footwalk. The P&H erector will provide the bulbs. (400W sodium vapor).

(4.6) WIRING:

All wiring in raceways and on panels will be type THHN, THWN or XHHW with insulation rated 75°C. Resistor wiring and similar hot location wiring will be XHHW type. Crane will be wired in accordance with National Electric Code and requirements of the State of Kentucky.

(4.7) MAINLINE CONDUCTORS:

The mainline conductors will be of the enclosed rigid type and will comply with N.E.C., Article 610. The mainline collectors will be SAF-T-BAR on an approved equal type providing for horizontal and vertical movement. Current shunts will be provided to protect springs and hinge points. Provide spool type insulators.

Conductors to be mounted in web of runway beam.

(4.8) SPAN CONDUCTORS:

The bridge span conductors will consist of a festooned system using portable insulated cable supported from an adequate number of 4-wheel heavy duty trolleys operating on the bottom flange of a 6" standard I-beam. The I-beam track will be rigidly attached outside the rear girder of the crane. The cable trolleys will have steel plate sides with four (4) flanged wheels with anti-friction bearings. External grease fittings will be provided to allow for regreasing due to unusually severe operating conditions. The cable trolleys will be linked together by machine chain not exceeding 10' between trolleys.

Each trolley will be provided with bumpers to prevent interlocking or jamming with adjoining trolley wheels. Conductors will be flat or round Type "W" or

"SO" flexible portable cable with 75°C temperature rating, oil resistant outer jacket, and will terminate in suitable boxes.

(4.9) ELECTRO HYDRAULIC CLAMSHELL BUCKET:

A 16 cubic yard electro hydraulic clamshell bucket will be furnished by the purchaser. P&H will provide a non-reversing magnetic starter control for this bucket with a switch for "open/close" mounted in the cab. P&H will also furnish the cable reel and cable to the bucket. The cable reel will be mounted above the trolley deck for servicing. Cable reel to be a heavy duty motor driven gear type. Cable reel to be synchronized with hoisting speed and suitable for constant severe service. Bucket motor horsepower will be 125.

P&H

DUTY CYCLE ANALYSIS

CI29638

TO: Louisville & Jefferson Cty.
Alternate I

DATE: October 2, 1987
PROPOSAL NO: 89083-207
CRANE NO: CI-29638

CYCLE: Barge to Surgehopper (1500T in 4.0 Hrs. = 375 TPH)

MATERIAL	AM'T HANDLED PER HOUR	AM'T HANDLED PER CYCLE	CYCLES REQ'D	SEC. PER CYCLE	TIME REQ'D SEC	TIME REQ'D HOUR
Coal	375T	13.5T	27.8	110.0	3058	.85

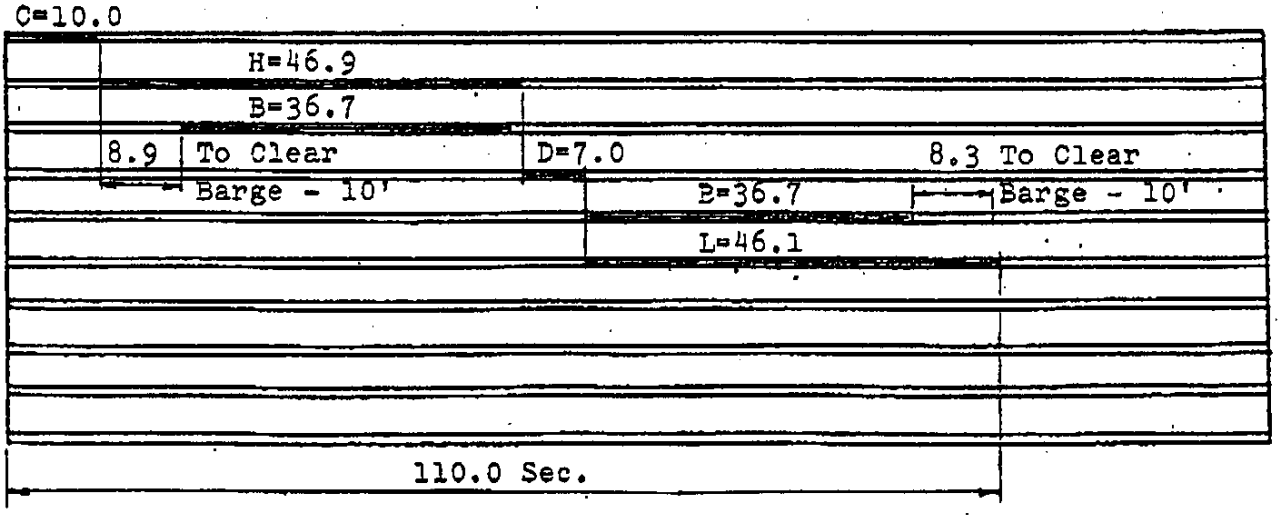
MOTION	TRAVEL DIST.FT.	ACCEL. SEC.	RUN SEC.	DECEL. SEC.	TOTAL SEC.
CLOSE					10.0
HOIST	67	4.0	42.4	0.5	46.9
~~TROLLEY~~					
BRIDGE	200	6.7	23.3	6.7	36.7
~~LOWER~~					
DISCHARGE					7.0
~~HOIST~~					
~~TROLLEY~~					
BRIDGE	200	6.7	23.3	6.7	36.7
LOWER	67	1.0	43.1	2.0	46.1

SPEEDS:

HOIST: 90 FPM

TROLLEY: NA FPM
@ FPSPS

BRIDGE: 400 FPM
@ 1.0 FPSPS



SUMMARY: $\frac{3058}{3600}$ = 85% for crane operation & 15% for efficiency.

Power requirements approx. 3.7 KW-HR/Cycle.
Brake and motor life is approx. 10 years, not considering normal replacement parts.

CI 29638

ELECTRICAL BILL OF MATERIAL — CRA[illegible]#C129638

CUSTOMER RIVERPORT AUTHORITY
LOCATION LOUISVILLE, KENTUCKY KY
CAPACITY 30 TONS SPAN 70'-0"
CRANE CLASS
SUPPLY 460 VOLTS AC 3 PHASE 60HZ
SERVICE OUTDOOR
CRANE WIRE & CONDUIT NEC / P&H
MAINLINE WIRE SIZE 250MCM PARALLEL P&H 2027
ELEMENTARY 101A 14302 A

ENG RELEASE DATE 12-11-87
ENG RELEASED BY J.C.HUGHES
SPEC RELEASE DATE 12-16-87
SPEC RELEASED BY S. NORMAN

AMBIENT TEMP 40 C

INTERCONNECTION 101A 14294

BRIDGE MOTOR FRAME SIZE(HEW 404X),FORM(A-E),HP(30.00),RPM(1200)
BULL. 562N PRI AMP (35.00),SEC AMP(57.50)SEC V (247.00)
TROLLEY MOTOR FRAME SIZE(HEW 324X),FORM(E),HP(10.00),RPM(1200)
BULL. 562N PRI AMP (13.10),SEC AMP(24.70)SEC V (202.00)
M HOIST MOTOR FRAME SIZE(HEW 587X),FORM(A),HP(200.00),RPM(1200)
BULL. 563N PRI AMP (217.00),SEC AMP(253.00)SEC V (364.00)

	BRIDGE	POWER WIRE	TROLLEY	POWER WIRE
REV. LEAD SIZE / TYPE	4 AWG	P&H 2027	12 AWG	P&H 2027
PRI. LEAD SIZE / TYPE	8 AWG	P&H 2027	12 AWG	P&H 2027
SEC & RES WIRE SIZE / TYPE	6 AWG	P&H 2027	10 AWG	P&H 2027
	M HOIST	POWER WIRE	GRAPLE	POWER WIRE
REV. LEAD SIZE / TYPE	4-0 AWG	P&H 2027	2/0 AWG	P&H 2027
PRI. LEAD SIZE / TYPE	4-0 AWG	P&H 2027	2/0 AWG	P&H 2027
SEC & RES WIRE SIZE / TYPE	250 MCM	P&H 2027		

BRIDGE TO TROLLEY FESTOON SYSTEM E77 1

QTY.	LENGTH	DIM	DESCRIPTION	QTY.	CORD GRIP
A 2	92'	.23-1.3	8 COND# 12 AWGP&H 2042	2	79Z4056D5
A 1	92'	.27-.88	4 COND# 10 AWGP&H 2042		
A 3	92'	.93	1 COND# 4-0AWGP&H 0233 M HOIST MTR PRI.	6	85Z24D13
A 3	92'	1.03	1 COND# 250 AWGP&H 0233 M HOIST MTR SEC.PAR.	6	85Z24D14
A 2	92'	.93	1 COND# 4-0AWGP&H 0233 M HOIST MTR DB	4	85Z24D13
A 3	92'	.84	1 COND# 2-0AWGP&H 0233 GRAPPLE MTR	6	85Z24D13
A 2	92'	.21-1.2	8 COND# 14 AWGP&H 2042		

TROLLEY MOUNTED EQUIPMENT

QTY.	DESCRIPTION		E#	E#
A 1	TROLLEY CONDUIT LAYOUT	100A 14383F1		
1	TROLLEY MOTOR 324 W/BRK	324M1328	E01	
1	M HOIST MOTOR 587	587M1089	E05	
1	M HOIST MAGNETORQUE 2408A	215028-75	E28	
2	M HOIST BRAKE FLR MTD	19SBE800ASC1	E08&	E58
1	M HOIST BRAKE WHEEL (1 BY MECH)	13F1868	E08	
2	M HOIST BRAKE COVER	14F4241	E08&	E58
B 1	M HOIST DB LIMIT SWITCH 270	100E5242-2	E21	
1	CABLE REEL	PR.# 224618		
A 1	M HST G.L.S.	479Q35D3		

ELECTRICAL BILL OF MATERIAL CRANE #C129638

BRIDGE MOUNTED EQUIPMENT

QTY.		DESCRIPTION		E#	E#				
A	1	BRIDGE CONDUIT LAYOUT	100A 14526F1						
	2	BRIDGE MOTOR 404	404M1189	E17	E89				
	2	BRIDGE BRAKE	10SBEM200ASC1	E89					
	2	BRIDGE BRAKE WHEEL	13F2035	E89					
	2	BRIDGE BRAKE BRACKET	15E640	E89					
	2	BRIDGE BRAKE COVER	14F4432	E89					
	4	BRIDGE BRAKE COVER BRACKET	29H924	E89					
	1	BR. & TR. CONTROL ENCL 100A14355F2	PR# 267125	E8					
	1	BR. BRK. PANEL 8"	979A1400F2	E25	E83				
	6	BRIDGE REACTOR	100A10147-6	E37	E83	13.25	7.75	10.00	86.00
	2	BRIDGE RESISTORS	80Q186D12	E83					
	1	BRIDGE ANODE TRANSFORMER	75Z1021D1						
	1	BRIDGE MODULE WIRE	1079E4F4	E83					
	1	TR. BRK. PANEL 5"	979A596F1	E26	E83				
	3	TROLLEY REACTOR	100A10143-6	E36	E83	9.50	6.50	9.25	38.00
	1	TROLLEY RESISTORS	80Q186D8	E83					
	1	TROLLEY REAC FORC RES 1.75 OHM	100F1816F7	E03	E83				
	1	TROLLEY ANODE TRANSFORMER	75Z1021D1						
	1	TROLLEY MODULE WIRE	1079E5F2	E83					
	1	BR. & TR. RESISTOR RACK 75-81-24	979A1678F4	E83					
	1	BR. & TR. MODULE	14A3541D3	E83					
	1	M HOIST CONTROL ENCL 100A14355F1	PR# 267125	E80					
	1	M HOIST BRK. PANEL 12"	979A1400F6	E23	E80				
	3	M HOIST REACTOR	100A10095-6	E80		21.00	15.88	18.13	539.00
	1	M HOIST RESISTORS	80Q187D15	E80					
	1	M HOIST REAC FORC RES 1.00 OHM	100F1816F4	E14	E80				
	1	M HOIST MAG FORC RES 4.00 OHM	100F1816F16	E15	E80				
	1	M HOIST ANODE TRANSFORMER	75Z1023D1						
	1	M HOIST MODULE WIRE	1079E1F12	E80					
	1	M HOIST RESISTOR RACK 56-81-24	979A1677F5	E80					
	1	M HOIST MODULE	14A3541D5	E80					
A	3	MAINLINE COLLECTORS	78Z45D1	E50					
	1	MAINLINE DISCONNECT	479Q44D20						
	3	MAINLINE DISCONNECT FUSES 400A	79Z754D29						
	1	NAMPLATE 460 A- 460 V- 3 PH	32H701D1	EE1					
	1	BR LIGHT SAFETY SWITCH 2-POLE 600V	79Z3071D1						
	2	BR LIGHT SAF. SW FUSES 15A	79Z96D7						
	3	BRIDGE LIGHTS	79U2403D604						
	3	BRDG REMOTE POWER CONNECTOR	79U2403D402						
	3	BRIDGE LIGHT BALLASTS	79U2403D118						
	3	BALLASTS HORZ MOUNTING BRACKET	79U2403D201						
	1	UTILITY SAFETY SWITCH 2-POLE 600V	79Z3071D1						
	2	UTILITY SAFETY SW FUSES 15A	79Z96D7						

BRIDGE MOUNTED EQUIPMENT CONT.

QTY.	DESCRIPTION		E#	E#
A 1	GRAPPLE DISCONNECT	479Q70D2		
3	GRAPPLE DISCONNECT FUSES 225A	79Z754D34		
3	HEATER ELEMENTS GRAPPLES	480Z5D104		
A 1	CABLE REEL CONTROL	979A2392F1	E24	
3	CABLE REEL FUSES 10 A	79Z754D7		
3	HEATER ELEMENTS CABLE REEL	480Z5D39		
A 1	CONTROL ENCL.	14Q83D22		
4	TRACK LIMIT SW. (2-BR. 2-TR.)	79Z601		
A 1	AIR CONDSAFETY SWITCH 2-POLE 600V	79Z3071D1		
A 2	" SAFETY SW FUSES 30A	79Z754D13		
B 1	UTILITY MODULE	14A3599F1		

CAB MOUNTED EQUIPMENT

QTY.	DESCRIPTION		E#	E#
A 1	CAB CONDUIT LAYOUT	100A 14524F1		
1	"START- STOP"	79Z1188		
1	GRAB OPEN - CLOSE	79Z1306D2		
1	BR. & TR. JOYSTICK ASS'Y	100A3619-1	E02	
1	M HOIST MASTER SW	100A3613-2		
1	WARNING DEVICE FOOT SWITCH	479Z32		
1	WARNING DEVICE	47Z46D1		
A 1	AIR COND. W/ HEAT	51Q467D5		
1	RECEPTACLE 120VAC 15AMP	79Z2146D1		
1	RECEPTACLE BOX	87Z46D4		
1	CAB LIGHT W/ SWITCH	3100F211D-1		
1	UTILITY LOAD CENTER	79Z3421D3		
5	UTILITY BRK'S 15A	79Z3420D1		
1	UTILITY BRK'S 30A	LATER		
1	CAB LIGHT FLOOD	56Z293D1		
1	CAB LIGHT FLOOD GUARD	56Z293D4		
1	CAB LIGHT FLOOD SW.	79Z2145		
1	BOX	87Z46D4		
1	PILOT LIGHT STATION	100H643-2	E22	
1	ACCUMALATING HOUR METER	89Z837		
1	UTILITY TRANSFORMER	75Q17D106		

milwaukee, wisconsin 53201 · (414) 671-4400 · coble HARNCO · telex 02-6725

Harnischfeger

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Milwaukee, Wisconsin U.S.A.

HARNISCHFEGER CORP.
CERTIFIED PRINT
USE ONLY FOR
YOUR ORDER ____
OUR ORDER CI-29638
DATE 1-29-88 O.K. ML

P&H Industrial Duty, Stock Component
Overhead Cranes
FEATURBILT-TYPE CI
Cab Operated
Single Hoist

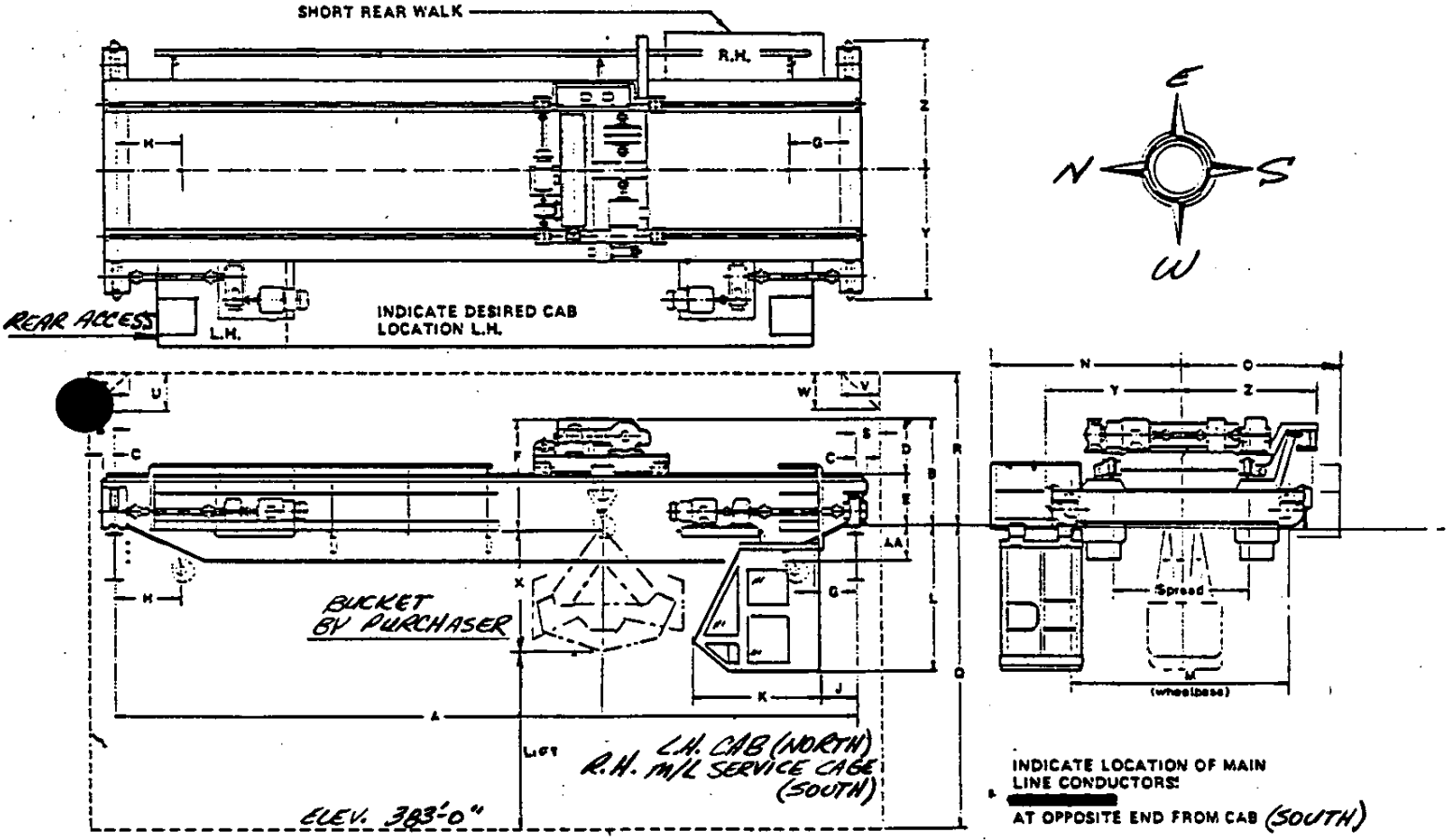
Date 1-29-88

To LOUISVILLE AND JEFFERSON COUNTY
RIVERPORT AUTHORITY
LOUISVILLE, KENTUCKY

Clearance Sketch No. 30GB70

Proposal No. 89083-207

CI-29638



Note: Dimensions are not for construction unless verified by Product Engineering Department.

	Capacity	30	Tons	H	4	ft.	6	in.	S	—	ft.	—	in.	Spread	13 ft. 0 in.
*	Lift	66	ft. 0 in.	J	2	ft.	0	in.	T	—	ft.	—	in.	Wt. of trolley	30,000 lbs.
	A	70	ft. 0 in.	K	8	ft.	5	in.	U	—	ft.	—	in.	Wt. of bridge	83,000 lbs.
	B	10	ft. 4¼ in.	L	8	ft.	5¼	in.	V	—	ft.	—	in.	Max. load per wheel	64,400 lbs.
	C	0	ft. 11¼ in.	M	17	ft.	10⅝	in.	W	—	ft.	—	in.		
	D	7	ft. 2¼ in.	N	15	ft.	1⅜	in.	Y	15	ft.	10	in.	Runway rail	75 lbs./yd.
	E	3	ft. 2 in.	O	15	ft.	1½	in.	Z	13	ft.	10	in.		
	F	12	ft. 4¼ in.	Q	82	ft.	0	in.	AA	2	ft.	1	in.		
	G	5	ft. 0 in.	R	—	ft.	—	in.	X	14	ft.	0	in.	(MAX. HEIGHT CLOSED BUCKET)	

HARNISCHFEGER NO. CI-2581 4-1-75

* 80'-0" LIFT FOR HOOK

TABLE OF CONTENTS FOR P&H CRANE CI-29638

SECTION ONE

TROLLEY MECHANICAL

SECTION TWO

BRIDGE MECHANICAL

SECTION THREE

MOTORS

SECTION FOUR

BRAKES

TABLE OF CONTENTS FOR P&H CRANE CI-29638

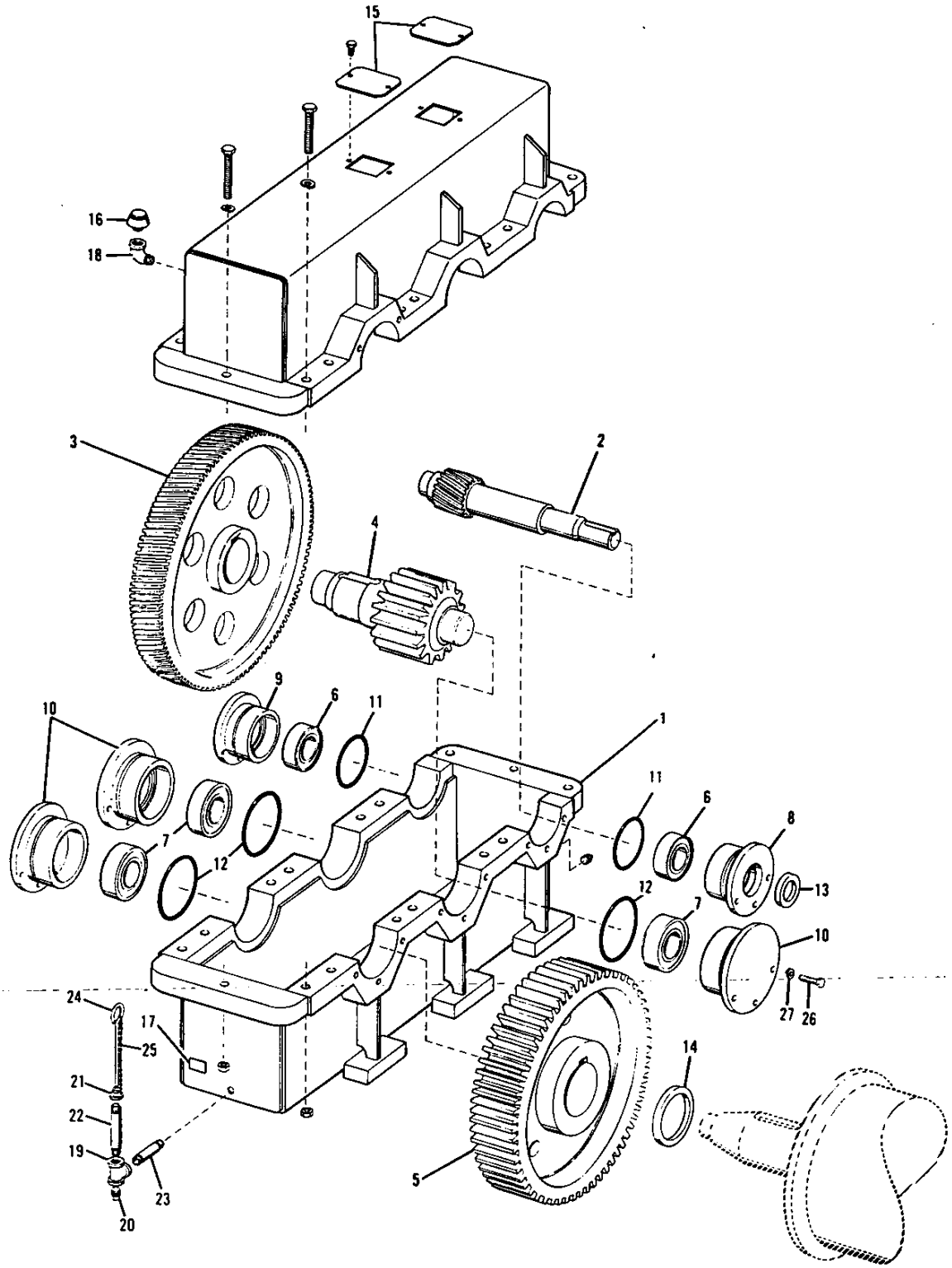
SECTION FIVE

ELECTRICAL EQUIPMENT

SECTION SIX

MISCELLANEOUS EQUIPMENT

ILLUSTRATION NO. CI-44
H-703 SPEED REDUCER ASSEMBLY



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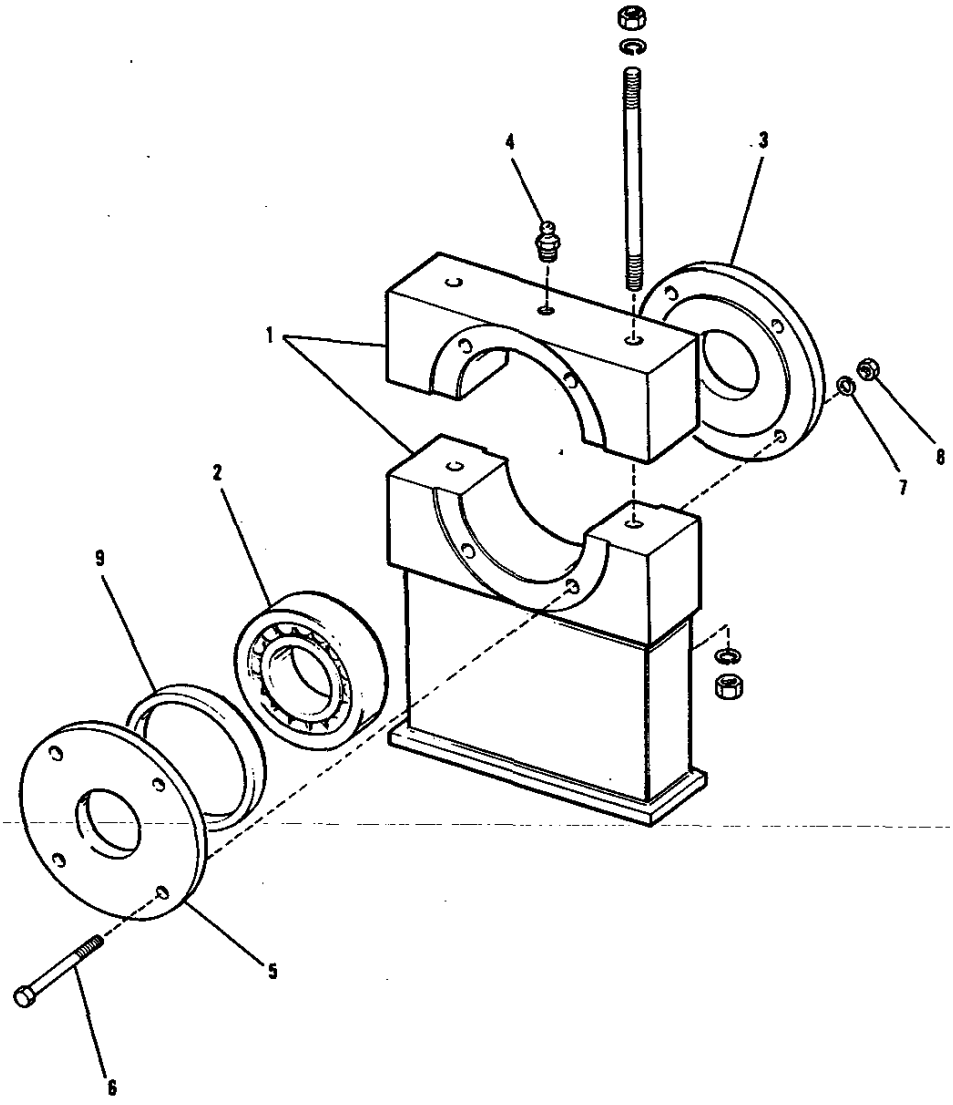
H-703 SPEED REDUCER ASSEMBLY
MAIN HOIST 100A8258F216

ITEM		DESCRIPTION	PART NO.	QTY
1		GEAR CASE	14A1915-F1	1
2	*	MOTOR PINION	1F13718F	1
3	*	MOTOR GEAR	1F12751	1
4		SHAFT, DRUM PINION	1F12746-C1F1	1
5		DRUM GEAR	1F12745C2	1
6	*	SPHERICAL ROLLER BEARING	25Z494D10	2
7	*	SPHERICAL ROLLER BEARING	25Z494D13	3
8		BEARING RETAINER	25F3441	1
9		NOT USED		
10		BEARING RETAINER	25F3261	3
11		O-RING	45Z91D72	2
12		O-RING	45Z91D64	3
13	*	OIL SEAL	18Q154D136	1
14	*	OIL SEAL	18Q154D165	1
15		INSPECTION COVER	914H10-7	2
16		AIRMAZE BREATHER	46Z31	1
17		LUBRICATION CHART	32Z340	1
18		STREET ELBOW, 3/4 IN X 90 DEG	2416V020	1
19		PIPE TEE, 3/4 IN	2425V005	1
20		PIPE PLUG, 3/4 IN	2423V005	2
21		PIPE CAP, 3/4 IN	16H2081	1
22		PIPE NIPPLE, 3/4 IN X 152 MM	2419V152	1
23		PIPE NIPPLE, 3/4 IN X 100 MM	2419V144	1
24		DIPSTICK	20F131D18	1
25		MACHINE CHAIN, NO.2 X 1 FT LG	------	1
26		CAPSCREW, HEX HD, M16 X 35 MM	0626M16035	15
27		LOCKWASHER, M16	3515M016	15

* - RECOMMENDED SPARE

ILLUSTRATION NO. CI-12
DRUM PEDESTAL ASSEMBLY



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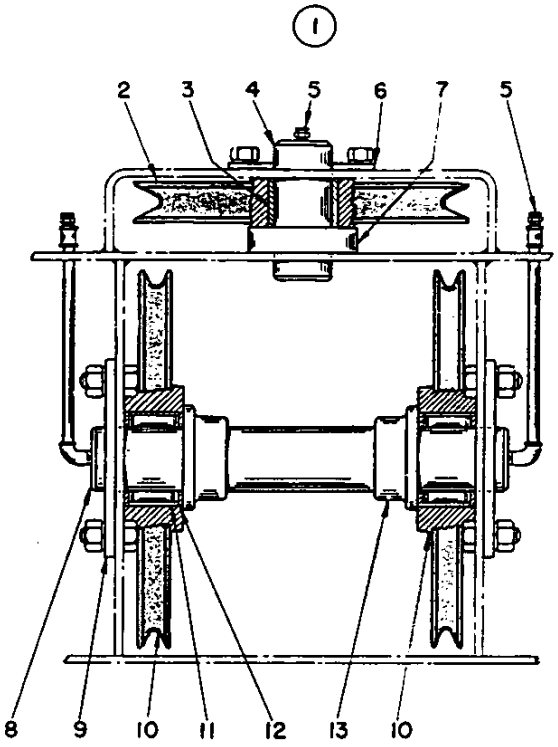
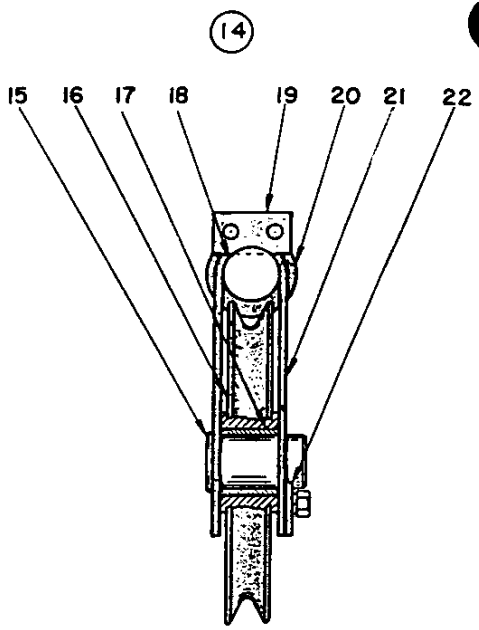
P&H

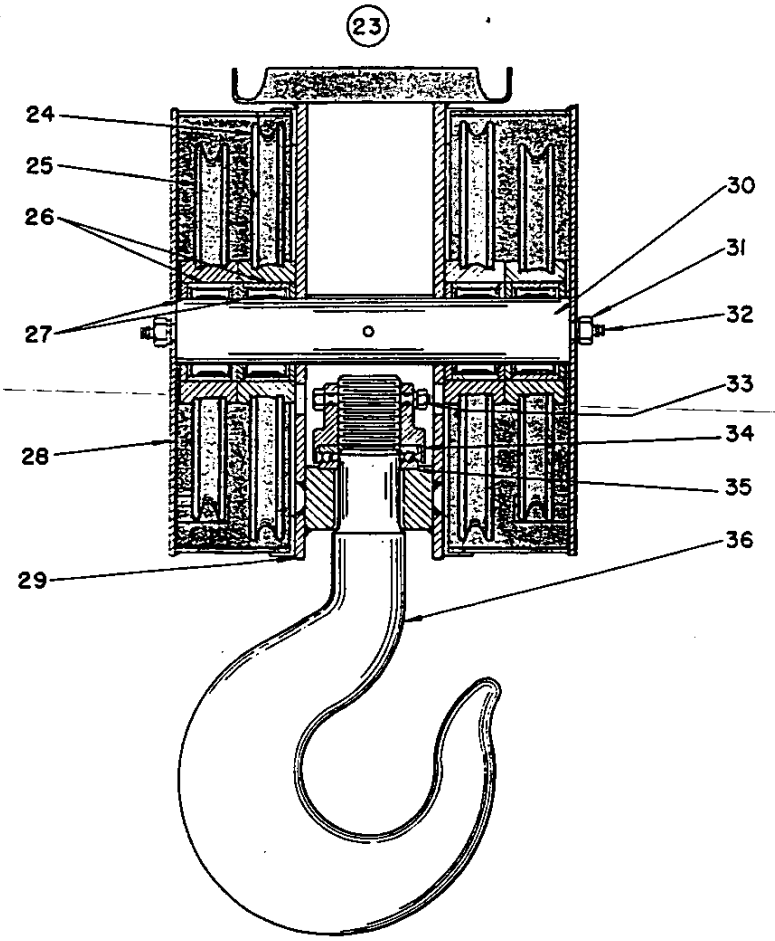
100E5636

ILLUSTRATION CHU-4

4 SHEAVE BOTTOM BLOCK







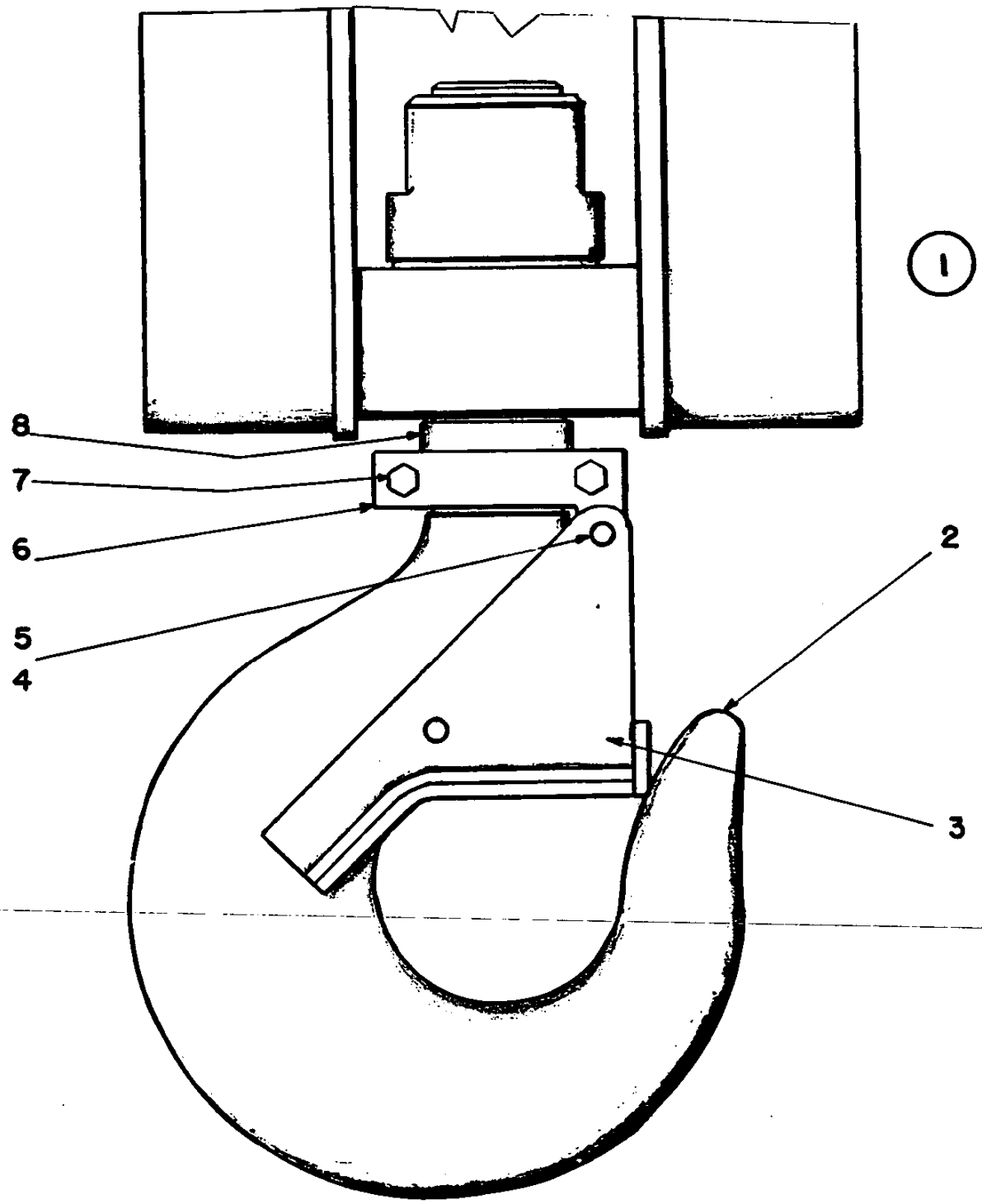
BOTTOM BLOCK ASSEMBLY
MAIN HOIST

ITEM	DESCRIPTION	PART NO.	QTY
	ITEMS 1 THRU 22 ARE NOT USED		
23	BOTTOM BLOCK ASSEMBLY	100E2382-3	1
	CONSISTS OF THE FOLLOWING ITEMS		
24 *	SHEAVE, LARGE	7H677	2
25 *	SHEAVE, SMALL	7H676	2
26 *	BEARING	25Z372D35	4
27	NOT USED		
28	SHEAVE GUARD	8F1253	2
	CAPSCREW, HEX HD, 5/8-11 X 3 IN	0626V119	12
	LOCKWASHER, 5/8 IN	3615V013	12
	HEX NUT, 5/8-11 THD	2045V007	12
29	SHEAVE FRAME	8F1361D2	1
30 *	SHEAVE PIN	19F154	1
	CAPSCREW, HEX HD, 5/8-11 X 6 IN	0626V127	1
	LOCKWASHER, 5/8 IN	3615V013	1
	HEX NUT, 5/8-11 THD	2045V007	1
31	CAPSCREW, SPECIAL	20H765	2
	LOCKWASHER, 7/8 IN	3615V016	2
32	GREASE FITTING, 1/8 IN	44Z1D5	2
33	CAPSCREW, HEX HD, 1/2-13 X 6-1/2 IN	0626V521	1
	LOCKWASHER, 1/2 IN	3615V011	1
	HEX NUT, 1/2 IN	2045V005	1
34	SEE ILLUST. C-48 FOLLOWING		
35 *	BEARING	25Z239D19	1
36	HOOK AND SAFETY LATCH ASSEMBLY	100F491-1	1
	SEE ILLUST. C-48 FOLLOWING		
	ITEMS 37 THRU 39 ARE NOT SHOWN		
37	CAPSCREW, HEX HD, 5/8-11 X 1-3/4 IN	0626V114	1
38	HEX NUT, JAM, 5/8-11 THD	2061V007	1
39	DOWEL PIN	19H1951D20	1

* - RECOMMENDED SPARE

ILLUSTRATION C-48

HOOK SAFETY LATCH



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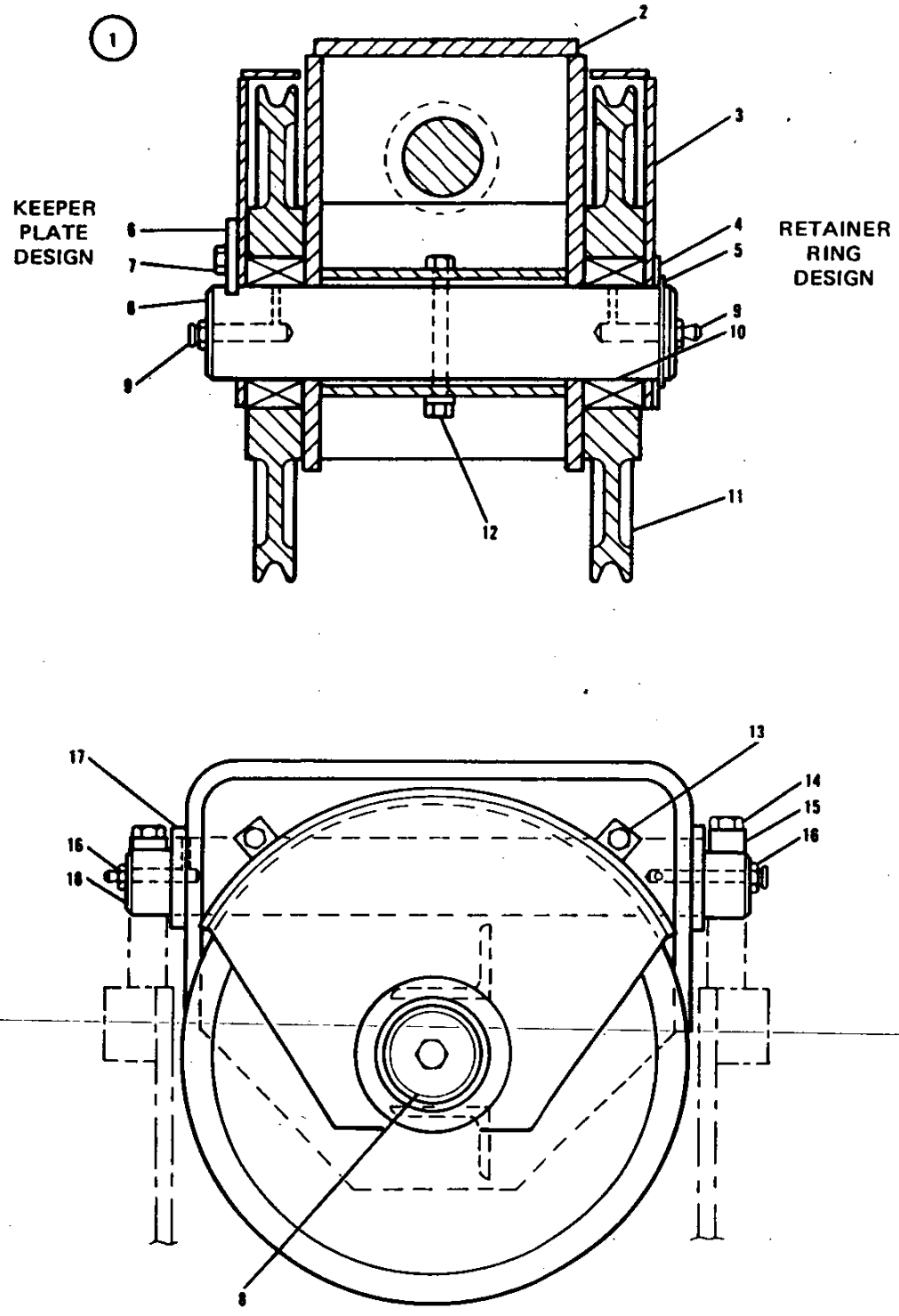
milwaukee, wisconsin, 53201

HOOK/SAFETY LATCH ASSEMBLY
MAIN HOIST

ITEM	DESCRIPTION	PART NO.	QTY
1	HOOK/SAFETY LATCH ASSEMBLY ..... INCLUDES ITEMS 2 THRU 7	100F491F1	1
2	HOOK (INCLUDES NUT)	8F1362F1	1
	HOOK NUT	20H732	1
3 *	SAFETY LATCH	32F190	1
4 *	PIN, DRILLED	19F52D31	1
5 *	COTTER PIN, 5/32X 1-1/4 IN.....	2203V051	2
6	CLAMP BRACKET	16H1686	1
7	SCREW, HEX HD CAP 5/8-11UNC x 6-1/2 IN.....	20Q260D418	2
	LOCKWASHER, 5/8 IN	3616V011	2
8	SPACER.....	18H5733	1

* - RECOMMENDED SPARE

ILLUSTRATION NO. CHU-27
TWO SHEAVE
UPPER BLOCK ASSEMBLY



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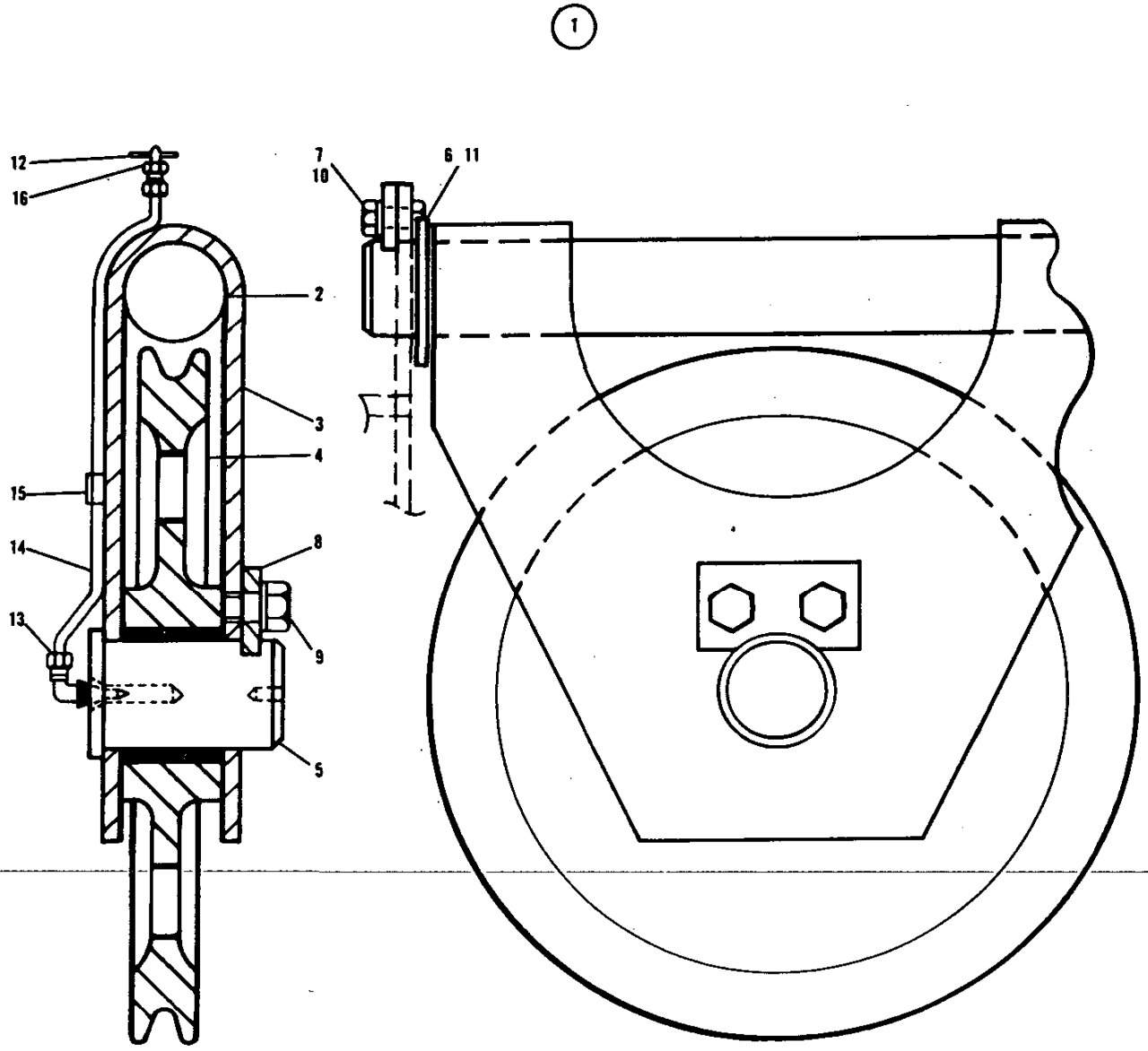
UPPER BLOCK ASSEMBLY
MAIN HOIST

ITEM		DESCRIPTION	PART NO.	QTY
1		UPPER BLOCK ASSEMBLY	100E4352-3	1
		CONSISTS OF THE FOLLOWING ITEMS		
2		NOT USED		
3		NOT USED		
4		NOT USED		
5		NOT USED		
6		KEEPER PLATE	18T26	2
7		CAPSCREW, HEX HD, 7/8-9 X 2-1/4 IN	0626V148	4
		LOCKWASHER 7/8 IN	3615V016	4
8	*	PIN,SHEAVE	19H2568C1	1
9		FITTING,GREASE	44Z1D6	2
10	*	BEARING	25Z372D35	2
11	*	SHEAVE	7H676	2
12		SETSCREW, SQ HD, 5/8-11 X 2-1/2 IN	0692V084	1
		JAM NUT, 5/8 IN	2061V007	1
		ITEMS 12 THRU 18 ARE NOT USED		
19		SPACER (NOT SHOWN)	18F1649D3	1
20		SEPARATOR (NOT SHOWN)	8F2755	2

* - RECOMMENDED SPARE

ILLUSTRATION NO. CHU-34
EQUALIZER ASSEMBLY



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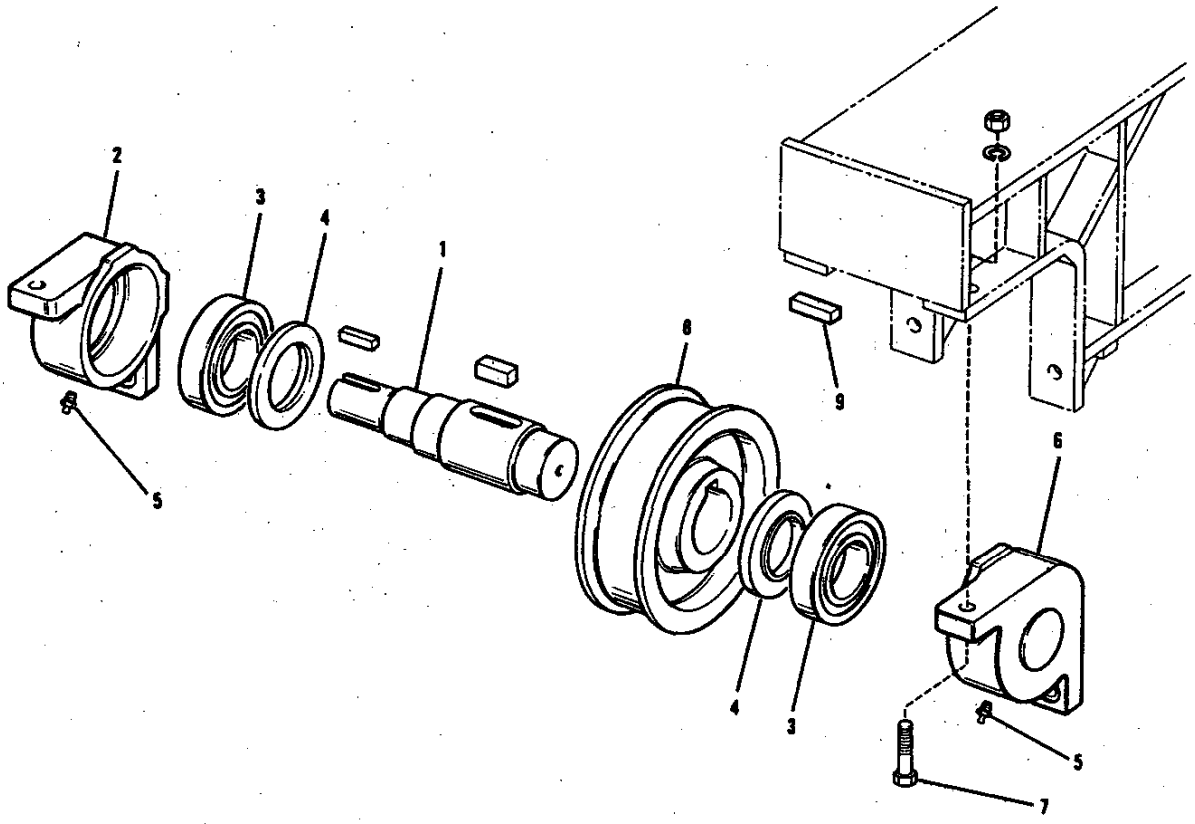
EQUALIZER ASSEMBLY
MAIN HOIST

ITEM		DESCRIPTION	PART NO.	QTY
1		EQUALIZER ASSEMBLY	907F92-14	1
		CONSISTS OF THE FOLLOWING		
2		SADDLE PIN	19H2569C2	1
3		SADDLE	~~8F239~~ 8H239	1
4	*	SHEAVE	7H317-C2-F1	1
5	*	SHEAVE PIN	19H1259C4	1
6		WASHER	18H3892D149	2
7		KEEPER PLATE	18T19	2
8		KEEPER PLATE	18T13	1
9		CAPSCREW, HEX HD, 3/4-10 X 1-1/4 IN	0626V129	1
10		CAPSCREW, HEX HD, 5/8-11 X 2 IN.....	0626V115	1
11		NOT USED		
12		LUBE FITTING, 1/4 IN	44Z1D6	1
13		MALE ELBOW, 90 DEG	44Z220D5	1
14		COPPER TUBE, 1/4 OD X 0.032 W X 14-3/4 IN.	------	1
15		TUBE CLIP, 1/4 IN	32Z114D2	1
16		FEMALE CONNECTOR	44Z368D5	1

* - RECOMMENDED SPARE

ILLUSTRATION NO. CI-10
BRIDGE AND TROLLEY DRIVE WHEEL ASSEMBLY



DRIVE WHEEL ASSEMBLY - 12 INCH
100A5150-3 TROLLEY 2 UNITS REQ'D.

ITEM		DESCRIPTION	PART NO.	QTY
1	*	AXLE, DRIVER	10F8469-F1	1
2		BEARING HOUSING	25F2998D1	1
3	*	SPHERICAL ROLLER BEARING	25Z494D12	2
4		SPACER	18F1671	2
5		LUBE FITTING	44Z1D14	2
6		BEARING HOUSING	25F2998D2	1
7		CAPSCREW, HEX HD, 3/4-10 X 3 IN	0626V136	4
		LOCKWASHER, 3/4 IN	3615V015	4
		HEX NUT, 3/4-10	2045V008	4
8	*	WHEEL, 2-3/4 IN TREAD	13F2709D2	1
9		SHEAR BAR	99F86D1	2

* - RECOMMENDED SPARE

ILLUSTRATION NO. CI-11
BRIDGE AND TROLLEY IDLER WHEEL ASSEMBLY

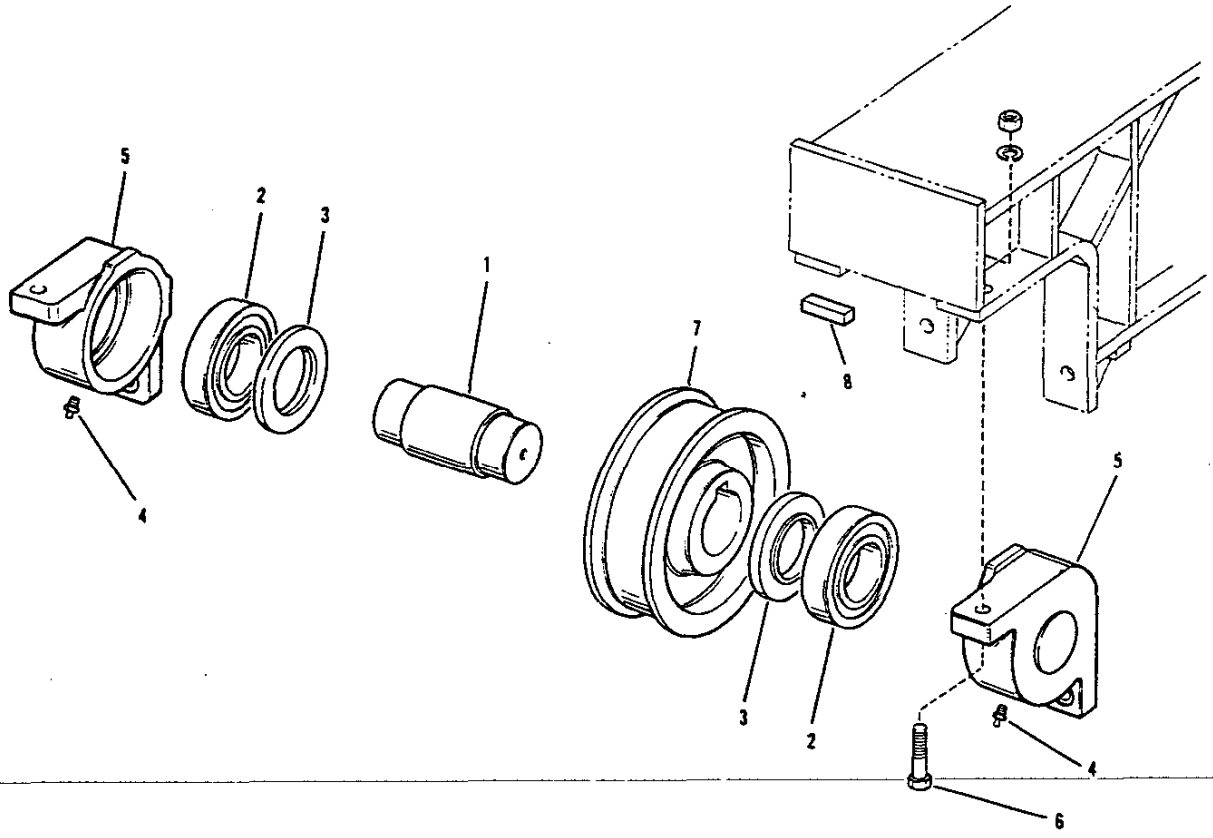


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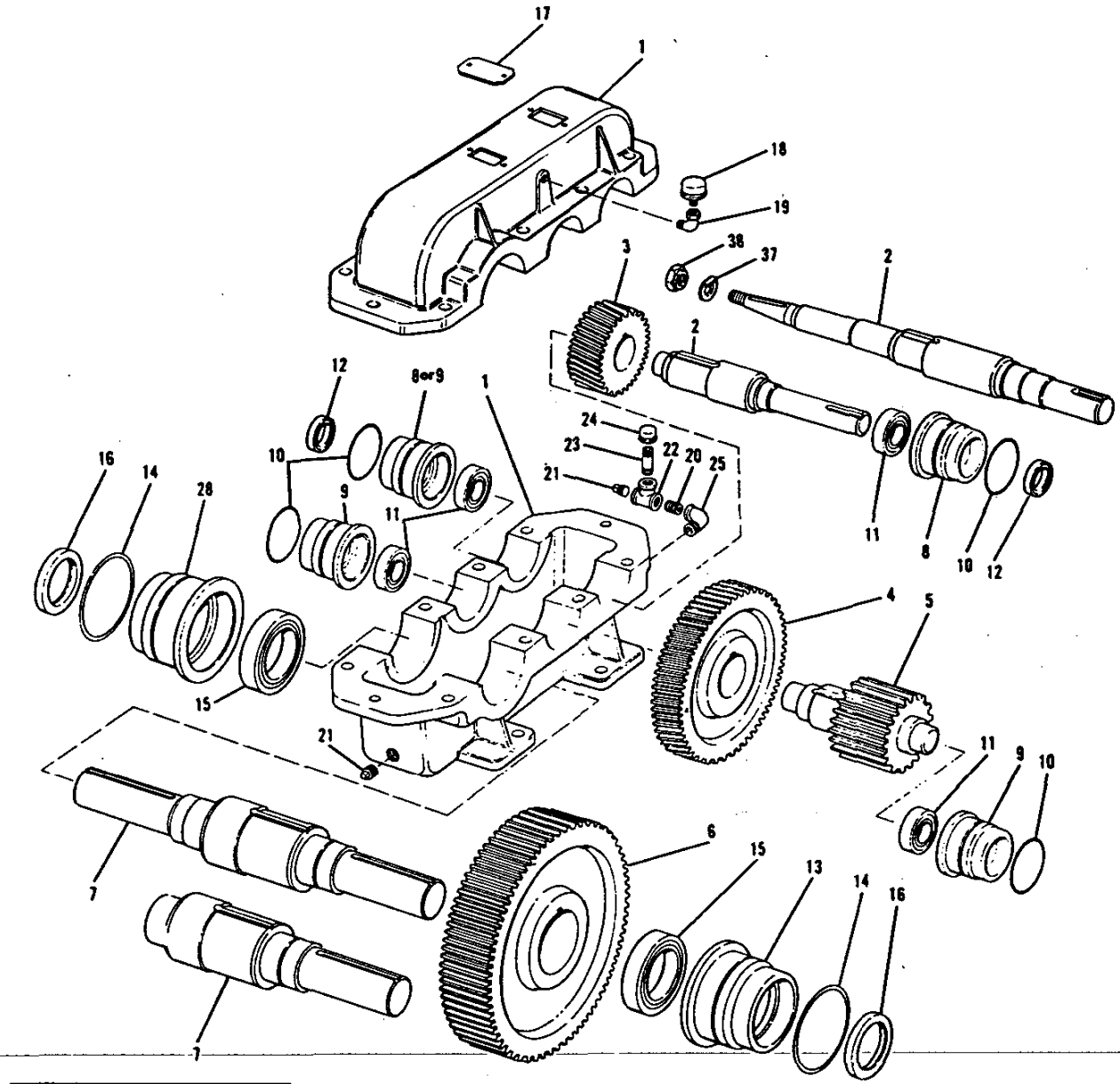
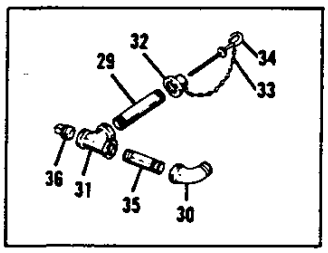
ILLUSTRATION NO. CI-8
TYPE D-153 SPEED REDUCER ASSEMBLY





REV/1-80

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P&H

100A7714
100A7904
100A7023
100A7024

WHEN ORDERING PARTS ALWAYS GIVE MODEL AND MACHINE SERIAL NUMBER

TYPE D-153 SPEED REDUCER ASSEMBLY
TROLLEY 100A7023F322

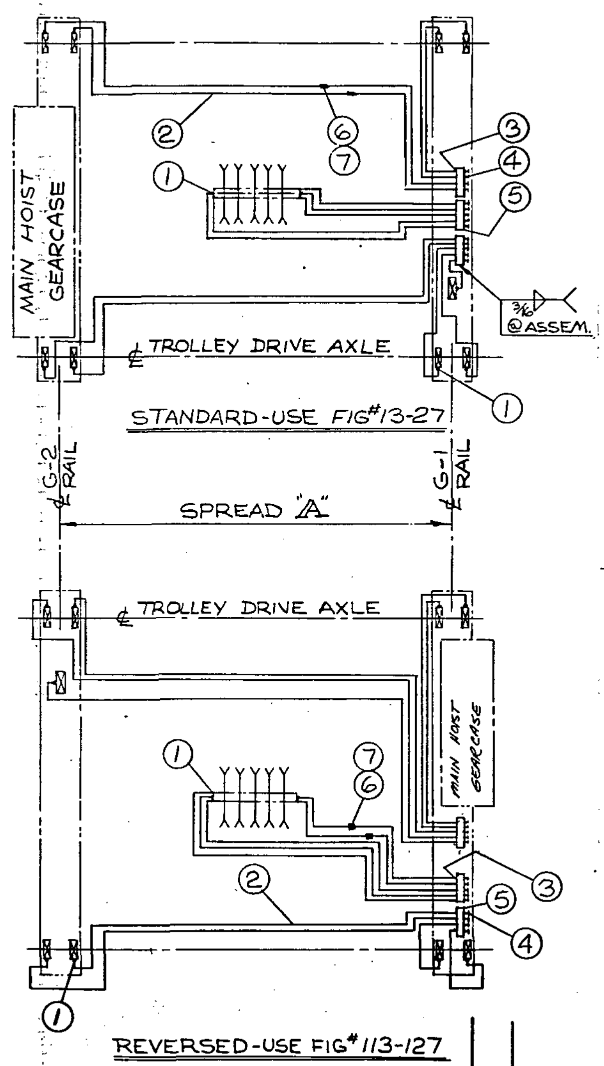
ITEM		DESCRIPTION	PART NO.	QTY
1		GEAR CASE	14A1671F1	1
2		SHAFT, MOTOR	INTEGRAL	1
3	*	PINION, MOTOR	1F12761F1	1
4	*	GEAR, MOTOR	1F12763	1
5		SHAFT, INTERMEDIATE	1F1268F1	1
6		GEAR, DRIVE	1F12773	1
7		SHAFT, DRIVE	10F9432F1	1
8		BEARING RETAINER	25F3264D2	1
9		BEARING RETAINER	25F3264D1	3
10		O-RING	45Z91D100	8
11	*	SPHERICAL ROLLER BEARING	25Z494D1	4
12	*	OIL SEAL	18Q154D78	1
13		BEARING RETAINER	25F3527D2	1
14		O-RING	45Z91D70	4
15	*	SPHERICAL ROLLER BEARING	25Z494D7	2
16	*	OIL SEAL	18Q154D125	2
17		INSPECTION COVER	914H10-7	1
18		BREATHER	46Z4	1
19		STREET ELBOW, 3/8 IN X 90 DEG	2416V018	1
20		PIPE NIPPLE 1/2 X 95	2419V112	1
21		PIPE PLUG, 1/2 IN	2423V004	2
22		PIPE TEE, 1/2 IN	2425V004	1
23		PIPE NIPPLE, 1/2 IN X 115 MM	2419V115	1
24		PIPE CAP, 1/2 IN	2403V004	1
25		STREET ELBOW 1/2 X 90	2416V019	1
26		LUBRICATION CHART (NOT SHOWN)	32Z340	1
27		OIL LEVEL LABEL (NOT SHOWN)	32Z145	1
28		BEARING RETAINER	25F3527D2	1
		NOTE: ITEMS 29 THRU 38 NOT USED		

* - RECOMMENDED SPARE

DWG. NO. 100E5503

BILL OF MATERIAL

NO. REQUIRED	DESCRIPTION	PART NO.	ITEM NO.
14	3/8" MALE ELBOW	447220D11	1
1	3/8" O.D. COPPER TUBE × "B"		2
14	3/8" MALE CONNECTOR	447219D10	3
14	1/4" IAN	447ID10	4
3	NESTING BRACKET	182823705.	5
70	TUBE CLIP	32Z114 D4	6
70	1/4 × 3/8" HEX. HD. TAPPING SCREW W/"B" PT.	20Z41 D2	7



STANDARD		
PART NUMBER	SPREAD "A"	LENGTH "B"
100E5503-13	8'-0"	132'-0"
-14	8'-6"	135'-0"
-15	9'-0"	138'-0"
-16	9'-6"	141'-0"
-17	10'-0"	145'-0"
-18	10'-6"	148'-0"
-19	11'-0"	151'-0"
-20	11'-6"	154'-0"
-21	12'-0"	157'-0"
-22	12'-6"	160'-0"
-23	13'-0"	163'-0"
-24	13'-6"	166'-0"
-25	14'-0"	170'-0"
-26	14'-6"	173'-0"
-27	15'-0"	176'-0"

TROLLEY REVERSED		
PART NUMBER	SPREAD "A"	LENGTH "B"
100E5503-113	8'-0"	132'-0"
-114	8'-6"	135'-0"
-115	9'-0"	138'-0"
-116	9'-6"	141'-0"
-117	10'-0"	145'-0"
-118	10'-6"	148'-0"
-119	11'-0"	151'-0"
-120	11'-6"	154'-0"
-121	12'-0"	157'-0"
-122	12'-6"	160'-0"
-123	13'-0"	163'-0"
-124	13'-6"	166'-0"
-125	14'-0"	170'-0"
-126	14'-6"	173'-0"
-127	15'-0"	176'-0"

AWS - D14.1:
ALL WELDS SHALL BE MADE WITH 70,000 PSI TENSILE STRENGTH FILLER METAL. WELD JOINTS ARE TO BE PREHEATED TO 70°F MINIMUM UNLESS HIGHER PREHEATS ARE SPECIFIED IN WELD SYMBOLS.

CI CRANE STANDARD

TROLLEY

CHANGE MARK	CHANGE	W.O. BY	CHK'D. BY	APP. BY
B	SEE ERN 100E5503 A	RDW 6-19-85		
A	SEE ERN	RDW 1-14-87	RDW 1-14-87	

FULL SCALE

GENERAL TOLERANCE NOTES

DECIMAL PLACE		STRUCTURAL	MACHINING
(1) PLACE	0.0	± .250"	± .040"
(2) PLACE	0.00	± .150"	± .020"
(3) PLACE	0.000	± .060"	± .010"
(4) PLACE	0.0000	± .030"	± .005"

EXCEPTIONS:
1. TOL. BELOW ± .005" TO BE SHOWN TO UPPER AND LOWER LIMIT.
2. ∇ INDICATES USE OF DECIMAL PLACE TOLERANCE OTHER THAN INDICATED BY ORIGINAL DECIMAL DIMENSION.

SURFACE MARKED THUS ∇ MUST BE WITHIN A ROUGHNESS VALUE OF 250 MICROINCHES UNLESS OTHERWISE SPECIFIED

DR. RRL
DATE 12-5-77

TITLE NESTED TUBE SYSTEM
PROD. OR MODEL T1-20+30 TROLLEY
DWG. NO. 100E5503 -23

ILLUSTRATION CI-13
TROLLEY BUMPER

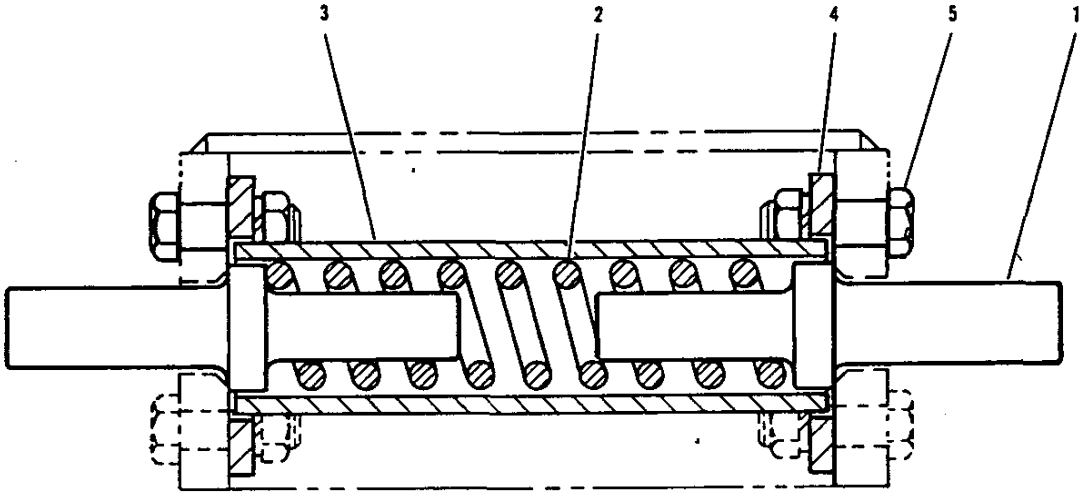


ILLUSTRATION CI-4
BRIDGE ASSEMBLY – A4 DRIVE

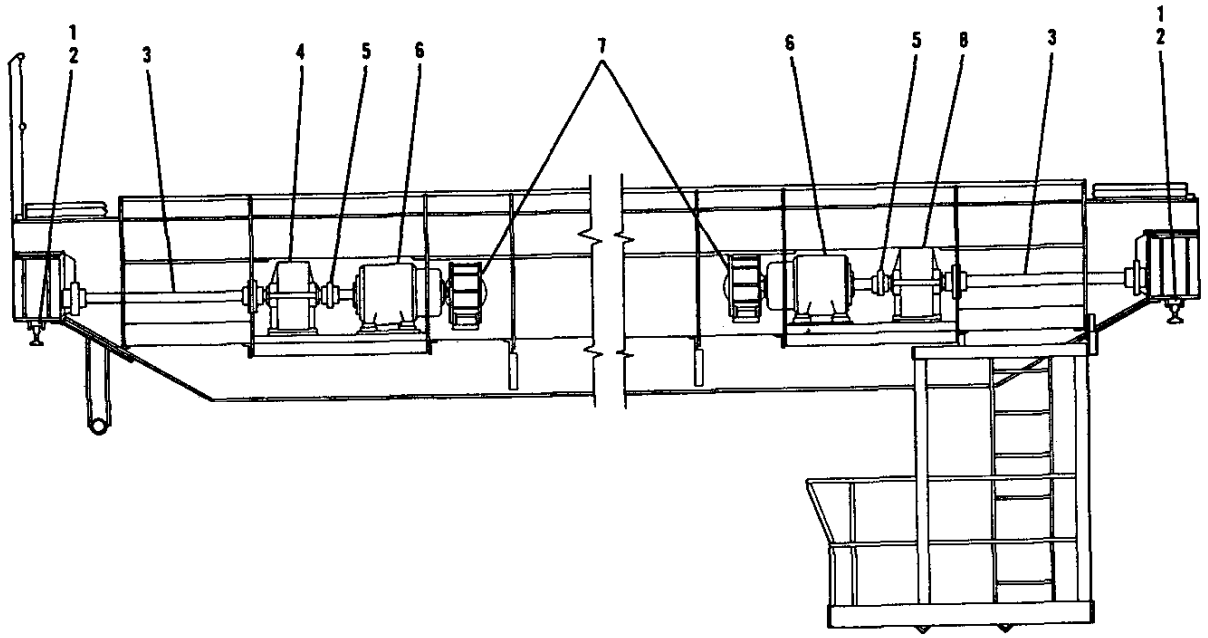
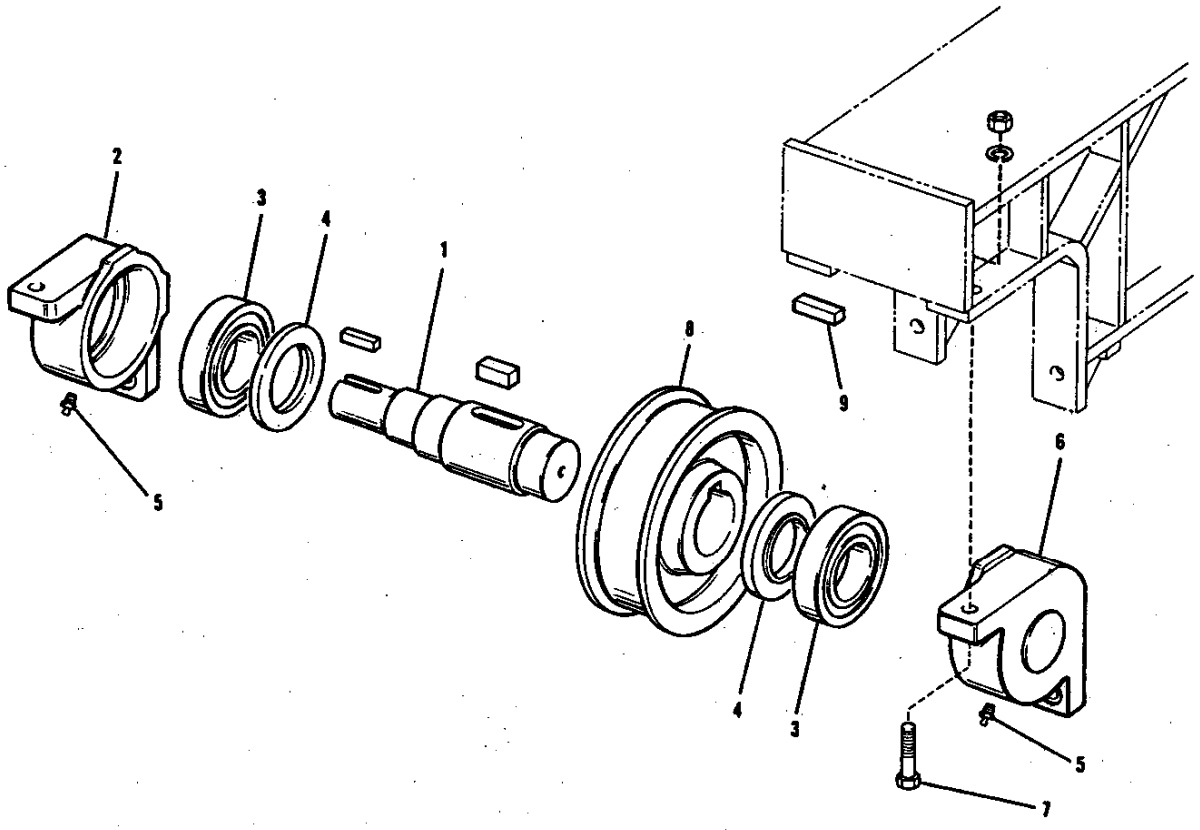
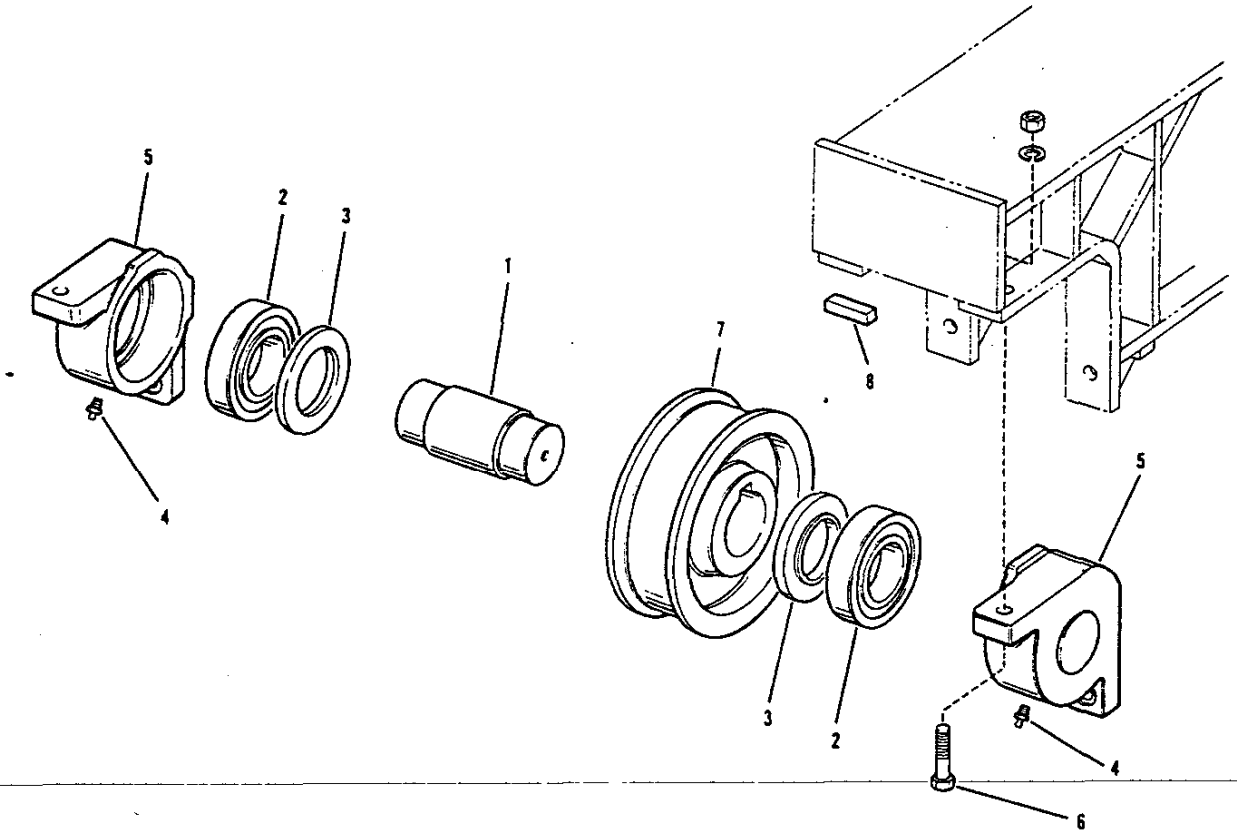


ILLUSTRATION NO. CI-10
BRIDGE AND TROLLEY DRIVE WHEEL ASSEMBLY



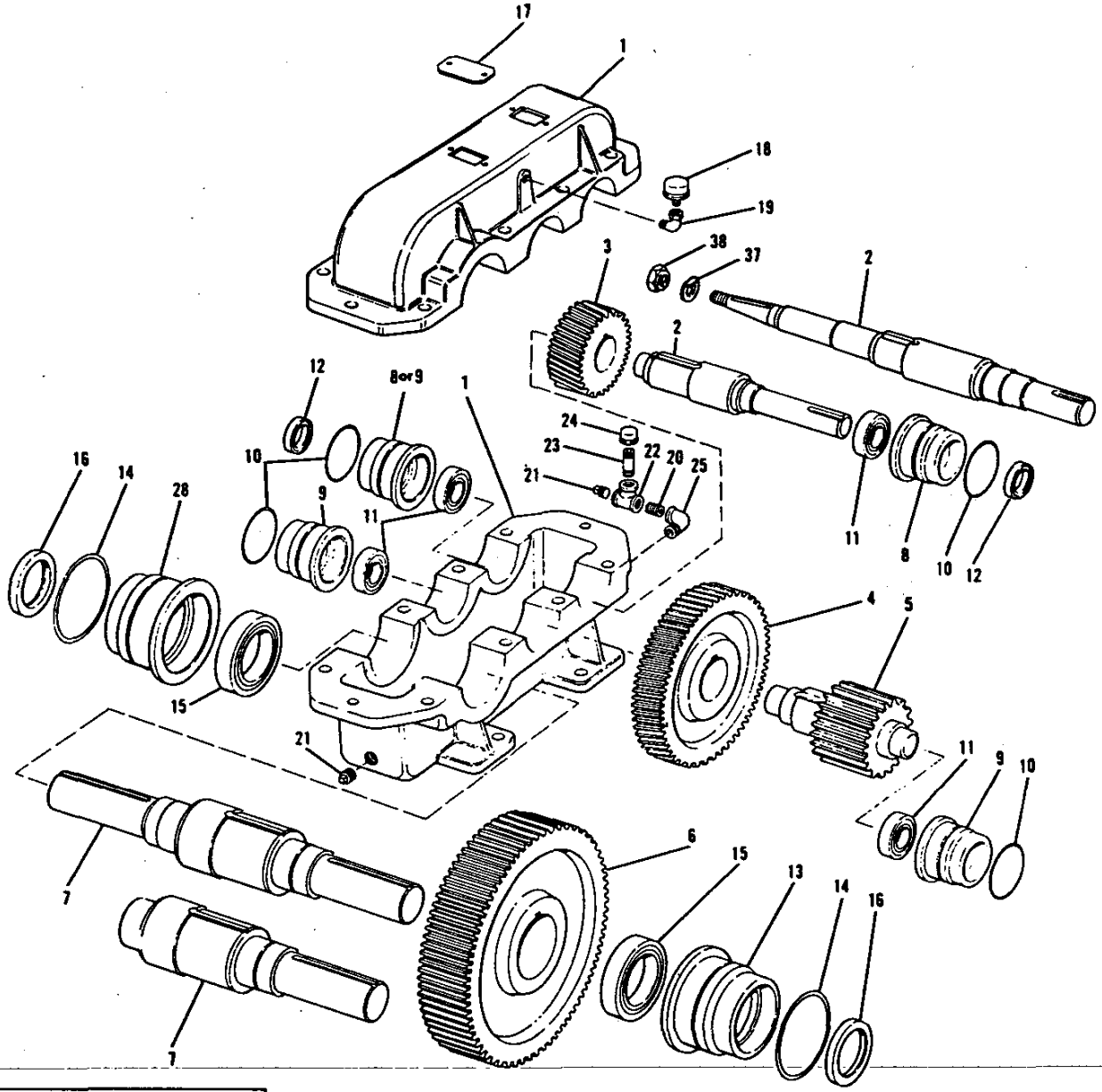
Harnischfeger
P&H

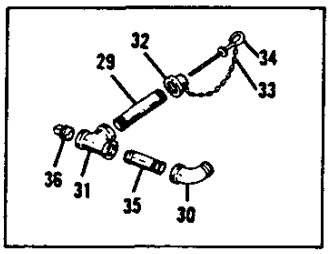
ILLUSTRATION NO. CI-11
BRIDGE AND TROLLEY IDLER WHEEL ASSEMBLY



Harnischfeger
P&H

ILLUSTRATION NO. CI-8
TYPE D-153 SPEED REDUCER ASSEMBLY





Harnischfeger
P&H

REV/1-80

100A7714
100A7904
100A7023
100A7024

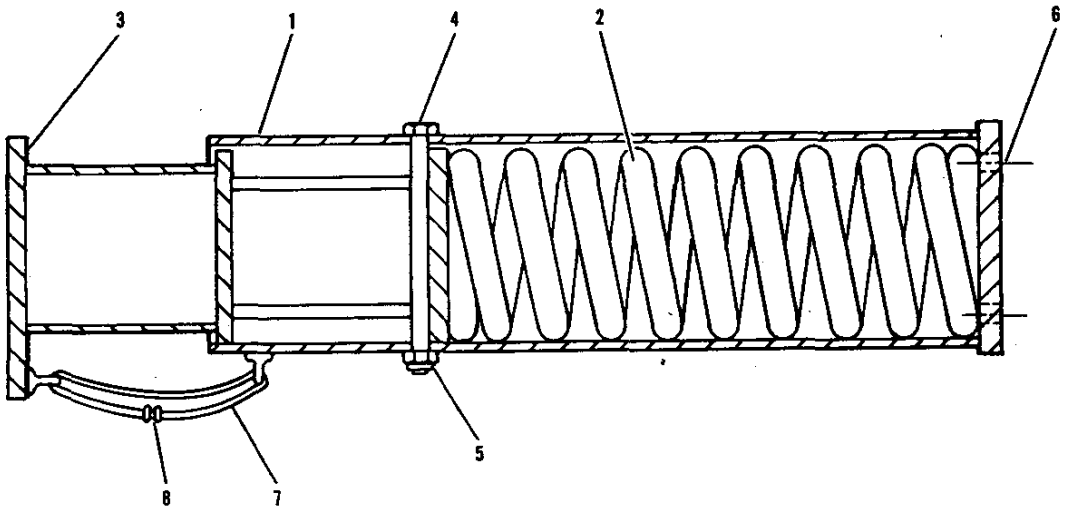
WHEN ORDERING PARTS ALWAYS GIVE MODEL AND MACHINE SERIAL NUMBER

TYPE D-153 SPEED REDUCER ASSEMBLY
BRIDGE

ITEM		DESCRIPTION	PART NO.	QTY
		100A7024F616 AS SHOWN 100A7024F716 OPP THAT SHOWN		
1		GEAR CASE	14A1671F1	1
2		SHAFT, MOTOR	INTEGRAL	1
3	*	PINION, MOTOR	1F12761C2F1	1
4	*	GEAR, MOTOR	1F12763C2	1
5		SHAFT, INTERMEDIATE	1F12765C1F1	1
6		GEAR, DRIVE	1F12770C2	1
7		SHAFT, DRIVE	10F9434F1	1
8		BEARING RETAINER	25F3264D2	1
9		BEARING RETAINER	25F3264D1	3
10		O-RING	45Z91D100	8
11	*	SPHERICAL ROLLER BEARING	25Z494D1	4
12	*	OIL SEAL	18Q154D78	1
13		BEARING RETAINER	25F3527D2	1
14		O-RING	45Z91D70	4
15	*	SPHERICAL ROLLER BEARING	25Z494D7	2
16	*	OIL SEAL	18Q154D125	2
17		INSPECTION COVER	914H27-F2	1
18		BREATHER	46Z4	1
19		STREET ELBOW, 3/8 IN X 90 DEG	2416V018	1
20		PIPE NIPPLE 1/2 X 95	2419V112	2
21		PIPE PLUG, 1/2 IN	2423V004	1
22		PIPE TEE, 1/2 IN	2425V004	1
23		CLOSE NIPPLE 1/2"	2419V102	1
24		PIPE CAP, 1/2 IN	2403V004	1
25		NOT USED		
26		LUBRICATION CHART (NOT SHOWN)	32Z340	1
27		OIL LEVEL LABEL (NOT SHOWN)	32Z145	1
28		BEARING RETAINER	25F3527D1	1
		NOTE: ITEMS 29 THRU 38 NOT USED		

* - RECOMMENDED SPARE

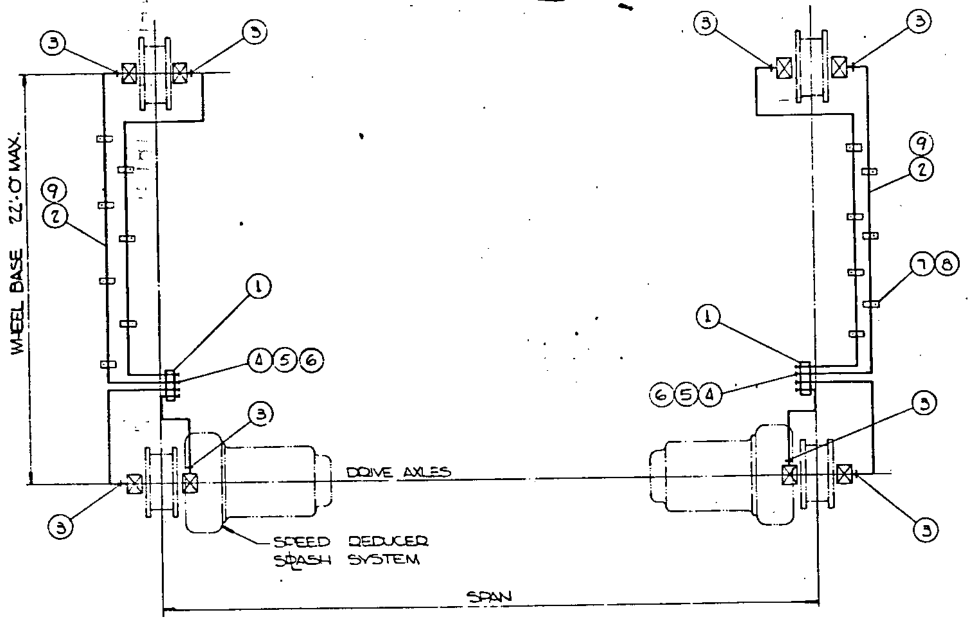
ILLUSTRATION NO. CI-14
BRIDGE SPRING BUMPER ASSEMBLY

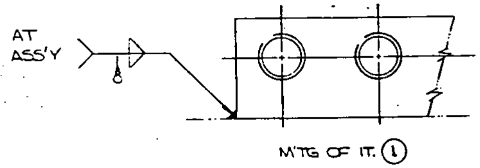


BRIDGE SPRING BUMPER
16E8499D2 4 UNITS REQ'D.

ITEM	DESCRIPTION	PART NO.	QTY
1	HOUSING	16E8499D2	1
2	SPRING	17Z663	1
3	PLUNGER	16F6405D1	1
4	MACH. BOLT, HEX HD, 5/8-11 X 9-1/2 IN	20Q260D424	1
5	STOP NUT	20Z716D17	1
6	CAPSCREW, HEX HD, 3/4-10 X 3-1/4"	20Q260D453	4
	HEX NUT, 3/4-10	20Q270D48	4
	LOCKWASHER, 3/4 IN	3616V015	4
7	CABLE, 3/8 IN DIA X 27 IN LG, TYPE 2	------	1
8	ROPE CLAMP	30Z1D4	2

3100E3025





NO. REQUIRED F/	DESCRIPTION	MATERIAL P&H NO	MATERIAL	PART NO SEMI-FIN.	PART NO.	UNIT WGT. RGH.	UNIT WGT. FIN.	SHT. NO. REF.	ITEM NO.
2	COUPLER BAR (4-HOLE)				18Z3237-D4				1
1	3/8" O.D. COPPER TUBE .023" WALL x 150'	204	ASTM B75-66						2
8	1/4" NPT, 3/8"-90° TUBE CONN.				44Z220-D11				3
8	1/4" BUTTON HEAD LUBE FITTING				44Z1-D5				4
-	1/8" HYDRAULIC LUBE FITTING				44Z1-D10				5
8	3/8"-1/8" NPT STRAIGHT TUBE CONN.				44Z719-D10				6
30	3/8" TUBE CLIP				31Z755-D3				7
30	#10-1/2" THD. FORM SCREW				20Z40-D14				8
-	3/16" O.D. COPPER TUBE .023" WALL x 65'	204	ASTM B75-66						9

NOTE:
USE ONLY P&H 472 LUBRICANT

F4	LEFT HAND TRUCK ONLY W/ HYDRAULIC FITTINGS
F3	RIGHT HAND TRUCK ONLY W/ HYDRAULIC FITTINGS
F2	BOTH TRUCKS W/ HYDRAULIC FITTINGS
F1	BOTH TRUCKS W/ BUTTON HEAD FITTINGS

CA CRANE STANDARD

18Z3237-D4 WAS 31BH3012-D3, SEE ERN 3100E3086 — 1-26-82

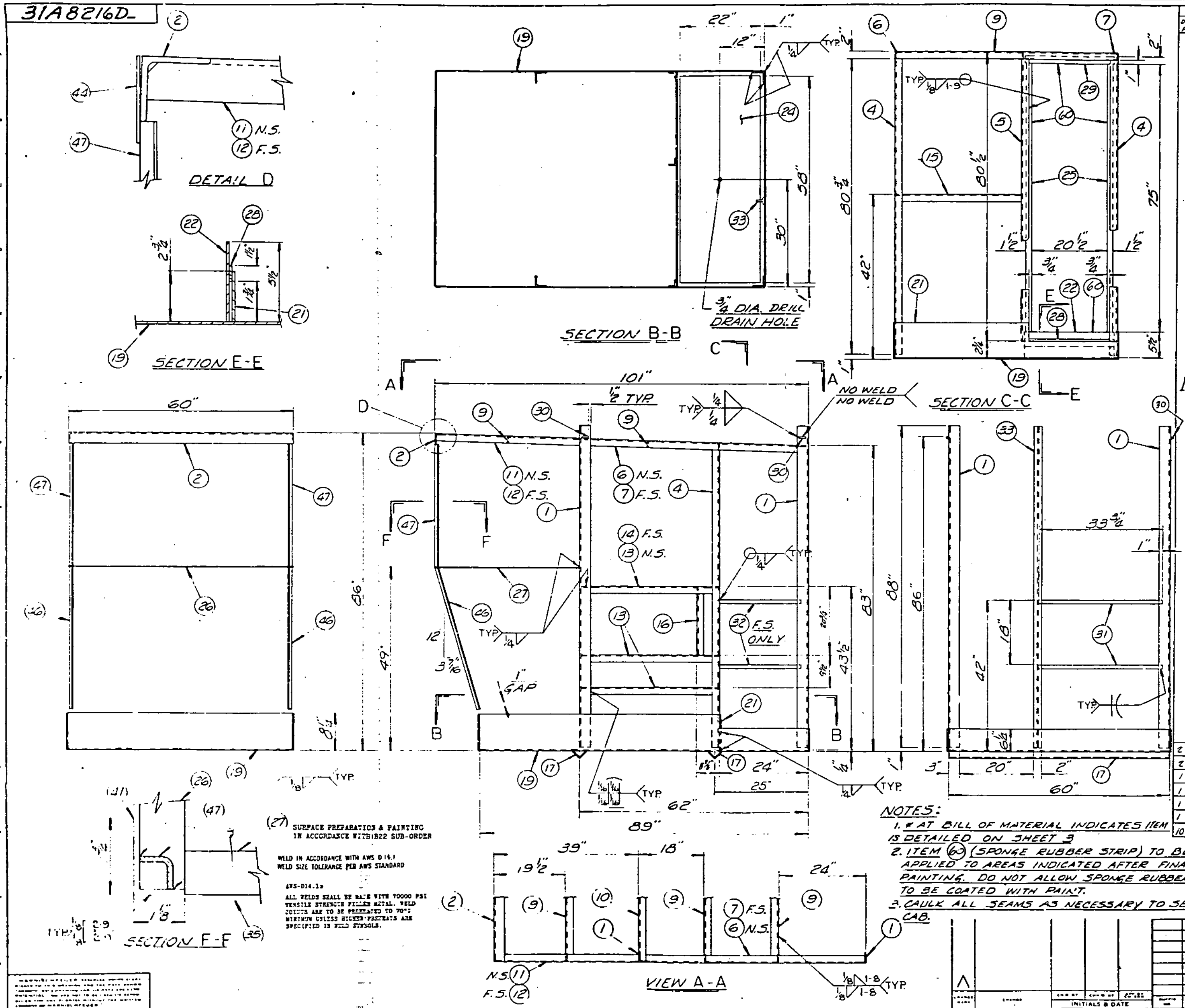
FULL SCALE

GENERAL TOLERANCE NOTES

SCALE: 1:1 — DATE: 7-6-78 — SIMILAR TO: 3100E2874

BRIDGE LUBRICATION SYSTEM

3100E3025-1



NOTES:

1. * AT BILL OF MATERIAL INDICATES ITEM IS DETAILED ON SHEET 3
2. ITEM (60) (SPONGE RUBBER STRIP) TO BE APPLIED TO AREAS INDICATED AFTER FINAL PAINTING. DO NOT ALLOW SPONGE RUBBER TO BE COATED WITH PAINT.
3. CAULK ALL SEAMS AS NECESSARY TO SEAL CAB.

BILL OF MATERIAL

D-F1	D2 D4 (Required)	Description	Material	Part No.	Unit Wt. Rgh.	Unit Wt. Fin.	Item No.
	4	L3"×3"×1/2"×7'-4"	180		146	146	1
	1	L3"×3"×1/4"×5'-0"	180		24	24	2
							3
	2	L2"×2"×1/4"×6'-8 3/4"	139		44	44	4
	1	L2"×2"×1/4"×6'-6 1/2"	139	COPE	21	21	5
	1	L2"×2"×1/4"×5'-1 1/2"	139	COPE	16	16	6
	1	L2"×2"×1/4"×5'-1 1/2"	139	COPE	16	16	7
							8
	3	L2"×2"×1/4"×4'-11 1/2"	139	COPE	47	47	9
	1	L2"×2"×1/4"×4'-11 1/2"	139	COPE	16	16	10
	1	L2"×2"×1/4"×3'-2 3/4"	139	COPE	10	10	11
	1	L2"×2"×1/4"×3'-2 3/4"	139	COPE	10	10	12
	3	L2"×2"×1/4"×3'-1 1/2"	139	COPE	30	30	13
	1	L2"×2"×1/4"×3'-1 1/2"	139	COPE	10	10	14
	1	L2"×2"×1/4"×2'-9 3/4"	139	COPE	9	9	15
	1	L2"×2"×1/4"×1'-8 1/2"	139	COPE	5	5	16
	2	L2"×2"×1/4"×5'-0"	139			31	17
							18
	1	PL 1/4"×76 1/8"×8'-7 1/8"	180	* BEND	397	560	19
							20
	1	PL 1/4"×8"×5'-0"	180	*	43	34	21
	1	PL 1/4"×5 1/2"×1'-11 1/2"	180		5	5	22
	1	PL 1/4"×1"×0'-3"	180	*	1	1	23
	1	CHK. PL 3/16"×22"×4'-10"	138		68	68	24
	2	BAR 1 1/2"×1/4"×6'-3"	129		56	56	25
	1	BAR 1"×1/4"×4'-11 3/4"	129		4	4	26
	2	BAR 1"×1/4"×3'-2"	129		5	5	27
	1	BAR 1 1/2"×1/4"×1'-11 1/2"	129		2	2	28
	1	BAR 2"×1/4"×1'-11 1/2"	129		3	3	29
	4	SQ. BAR 1/2"×1/2"×0'-2"	129		1	1	30
	2	RD. BAR 1" DIA.×2'-9 5/8"	129		15	15	31
	2	RD. BAR 1" DIA.×1'-10"	129		10	10	32
	1	TEE 2"×2"×1/4"×7'-3 1/2"	139				33
							34
	1	SHT. 12GA. 76 1/2"×6'-3"	144	* BEND	184	77	35
	1	SHT. 12GA. 76 1/2"×6'-9"	144	* BEND	184	93	36
	1	SHT. 12GA. 59 1/2"×6'-10 1/2"	144	* BEND	145	143	37
							38
	1	SHT. 12GA. 35 1/2"×6'-6 3/4"	144	BEND	83	83	39
							40
	1	SHT. 12GA. 47 3/4"×5'-1 3/4"	144	*	87	20	41
							42
							43
	1	SHT. 12GA. 4"×4'-5 1/2"	144		7	7	44
	2	SHT. 12GA. 2 5/8"×2'-11"	144	BEND	5	5	45
	2	SHT. 10GA. 1 1/4"×3'-5 3/8"	144	BEND	4	4	46
	2	SHT. 10GA. 1 1/4"×2'-10"	144	BEND	3	3	47
	1	SUPPORT		16F5104		35	48
	1	WINDOW FRAME		31A7472F1		28	49
							50
	–					125	51
	1	DOOR		31F1509-D2		125	52
	1	GATE ASSEMBLY		100E4871-2		12	53
2	–	SEE DRAWING FOLLOWING				44	
2	–					56	55
1	–					53	56
1	–					32	57
1	–					26	58
1	–					26	59
10	–						60

Part No.	Description
31A8216D6F1	OPPOSITE W/O GATE
31A8216D5F1	AS SHOWN W/O GATE
31A8216D4F1	OPPOSITE W/SIDE GATE
31A8216D3F1	AS SHOWN W/SIDE GATE
31A8216D2F1	OPPOSITE W/REAR GATE
31A8216D1F1	AS SHOWN W/REAR GATE

GENERAL TOLERANCE NOTES — STRUCTURAL ±1/16"

ESTIMATED WEIGHTS — FIN. 2201

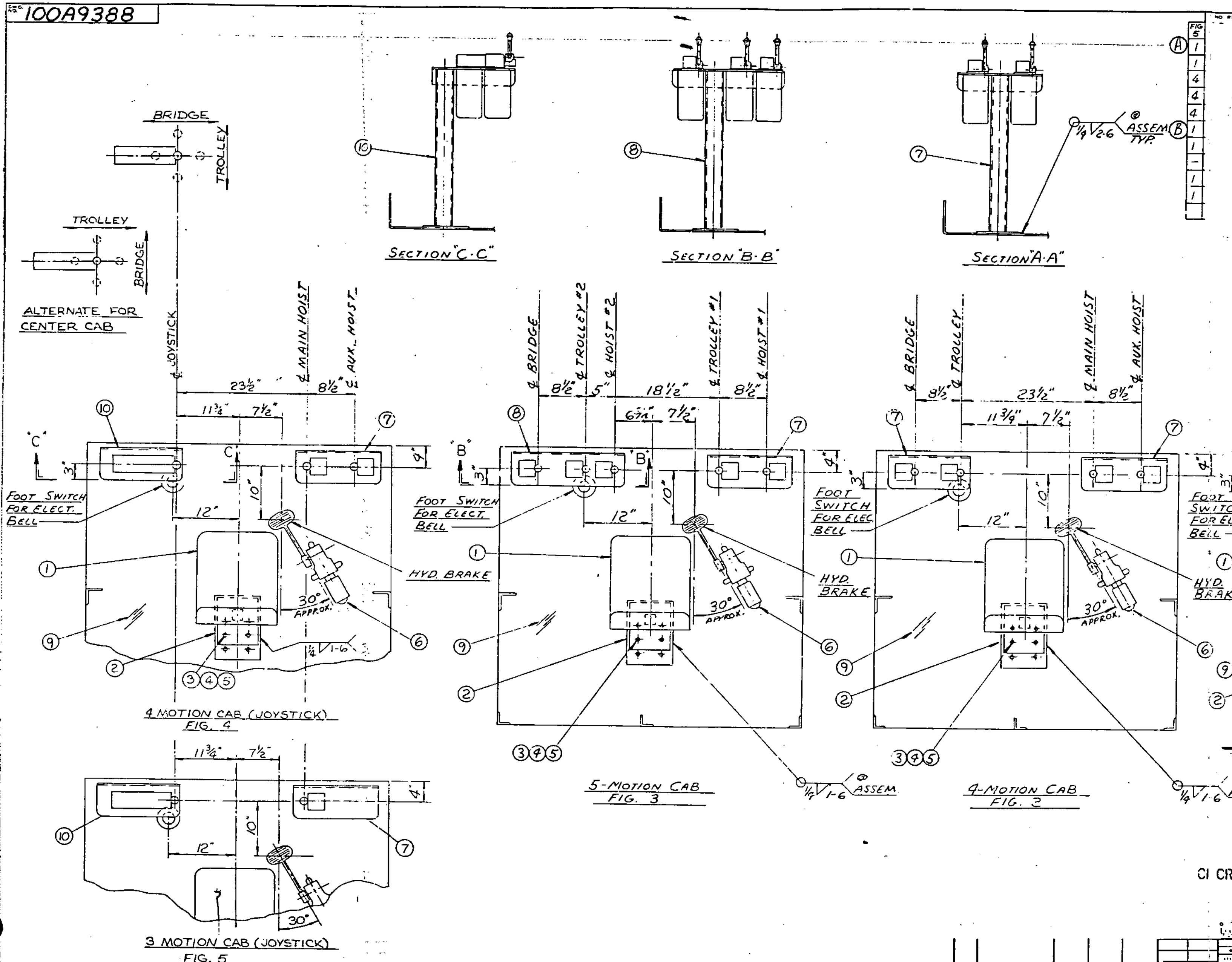
SCALE: NONE
DATE: 12-22-87
SIMILAR TO: 31A7540

Harnischfeger P&H

TITLE: ENCLOSED CAB W/AIR CONDITIONER
CI CRANES

DWG NO. 31A8216D2 SHT. 1 OF 3

100A9388



BILL OF MATERIAL

FIG 5	DESCRIPTION	MATERIAL	PART NO.	UNIT WT.	ITEM NO.
1 (A)	SEAT		48U3		1
1	SEAT MOUNT. ℞		31H127		2
4	5/8" x 1" HEX. HD. BOLT		0626V111		3
4	5/8" LOCKWASHER		3615V013		4
4	5/8" HEX. NUT		2095V007		5
1 (B)	HYD. BRAKE				6
1	CONTROLLER STD.		29F5055		7
–					8
1	RUBBER MAT 1/4" x 60" x 65"	899	CUT TO FIT		9
1	CONTROLLER STAND		29F5061		10
					11

(A) SEE ILLUS. C-50B
(B) SEE SECTION 4 FOLLOWING

CI CRANE STANDARD

FULL SCALE

GENERAL TOLERANCE NOTES ±1/16

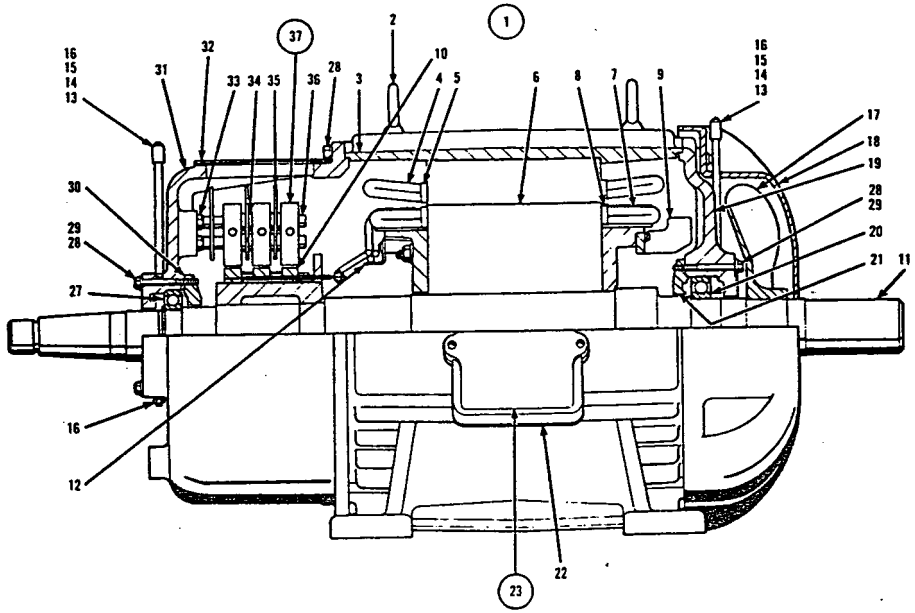
B.K. 3-28-80

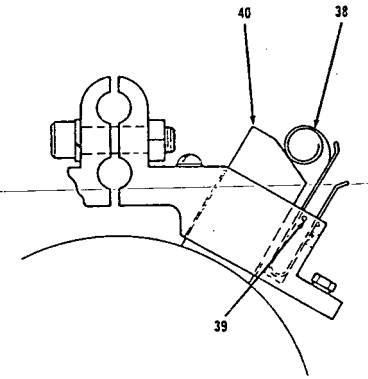
Harnischfeger P&H

TITLE CONTROLLER / SEAT ARRANGEMENT & ASSEMBLY CJ-CRANES

100A9388

ILLUSTRATION NO. HL-92
TYPE HEWY MOTOR





Harnischfeger
P&H

HEW 587 MOTOR ASSEMBLY
MAIN HOIST

ITEM	DESCRIPTION	PART NO.	QTY
1	MOTOR,HEW 587,200.00HP,460V,3PH,60HZ.....	587M1089	1
	CONSISTS OF THE FOLLOWING ITEMS		
2	NOT USED		
3	STATOR ASSEMBLY (INCLUDES ITEMS 4 AND 5) .	587M01302AF	1
4	STATOR COIL SET	587M01302F	1
5	SLOT INSULATION (FOR ONE SLOT)	570F60D163	90
6	ROTOR ASSEMBLY (INCLUDES ITEMS 7-11).....	5873M11616AF51R	1
7	ROTOR COIL SET	587M02051F	1
8	SLOT INSULATION (FOR ONE SLOT)	570F66D70	72
9	FAN	574E497	1
10	SLIP RING ASSEMBLY	9577A3-1	1
11	ROTOR SHAFT ASSEMBLY	510E1181D1F1	1
	INCLUDES THE FOLLOWING PARTS		
	LOCKWASHER,TABBED	18H7038D5	1
	LOCKNUT	20H1516D9	1
	SNAP RING	18Z2D13	1
	SNAP RING	18Z2D37	1
	LOCKNUT	20Z3D31	1
	LOCKWASHER	18Z1D21	1
12	NOT USED		
13	PIPE NIPPLE, 1/8 IN (ORDER BY LENGTH)	------	2
14	PIPE COUPLING, 1/8 IN	2409V001	2
15	GREASE FITTING, 1/8 IN	44Z1D10	2
16	PIPE PLUG, 1/8 IN	2423V001	4
17	FAN, EXTERNAL	574E495-F1	1
18	GUARD, FAN	14R12	1
19	REAR HEAD	572E1479	1
20	REAR BEARING	25T819D18	1
21	CAP, REAR BEARING (OUTER)	572F708	1
	CAP, REAR BEARING (INNER)	572F709	1
22	GASKET, TERMINAL BOX MOUNTING	520H793	1
23	TERMINAL BOX ASSEMBLY	514E560-F1	1
	INCLUDES ITEMS 24, 25 AND 26		
24	GASKET, TERM. BOX COVER	------	1
25	COVER, TERM. BOX	------	1
26	MACH. SCREW, HEX HD, 1/4-20 X 5/8 IN	0860V111	2
	LOCKWASHER, 1/4 IN	3616V007	2
27	FRONT BEARING	25T819D17	1
28	CAPSCREW, HEX HD, 3/8-16 X 1-1/2 IN	0826V043	8
	CAPSCREW, HEX HD, 3/8-16 X 1-1/4 IN	0826V042	4
29	LOCKWASHER ,3/8 IN	3616V009	12

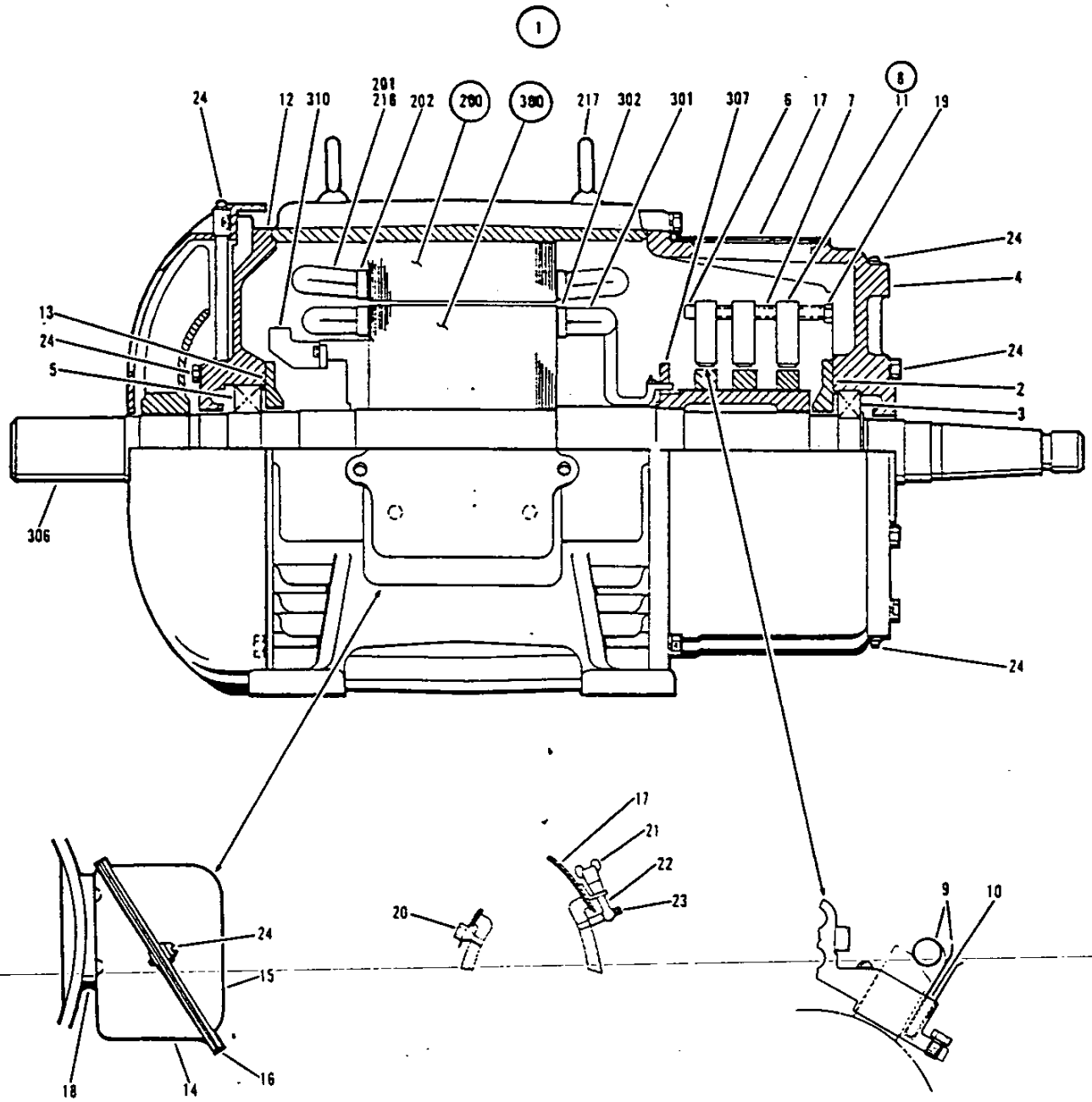
HEW 587 MOTOR ASSEMBLY
MAIN HOIST

REV. 5/90

ITEM		DESCRIPTION	PART NO.	QTY
30		CAP, FRONT BEARING (OUTER)	525F87	1
		CAP, FRONT BEARING (INNER)	525F88	2
31		FRONT HEAD	572A221	1
32		COVER, BRUSH INSPECTION	514F1192	2
33		STUD, BRUSHHOLDER	520H690	2
		HEX JAM NUT, 1/2-13	2161V005	2
34		SPACER, BRUSHHOLDER	518F314D2	8
35		SEPARATOR, BRUSHHOLDER	573F161	2
36		INSULATOR, BRUSHHOLDER STUD	518F134-1	2
37	*	BRUSHHOLDER ASSEMBLY	9573F66-5	1
	*	BRUSHHOLDER ASSEMBLY	9573F66-4	1
		EACH INCLUDES ITEMS 38 AND 39		
38	*	SPRING (W/BACKUP PLATE)	17Z548D1	2
39		ROLL PIN, 0.078 X 1 IN	19Z223D23	2
40	*	BRUSH, CARBON	73Q10D2	12

* - RECOMMENDED SPARE

ILLUSTRATION NO. CM-18
MOTOR ASSEMBLY



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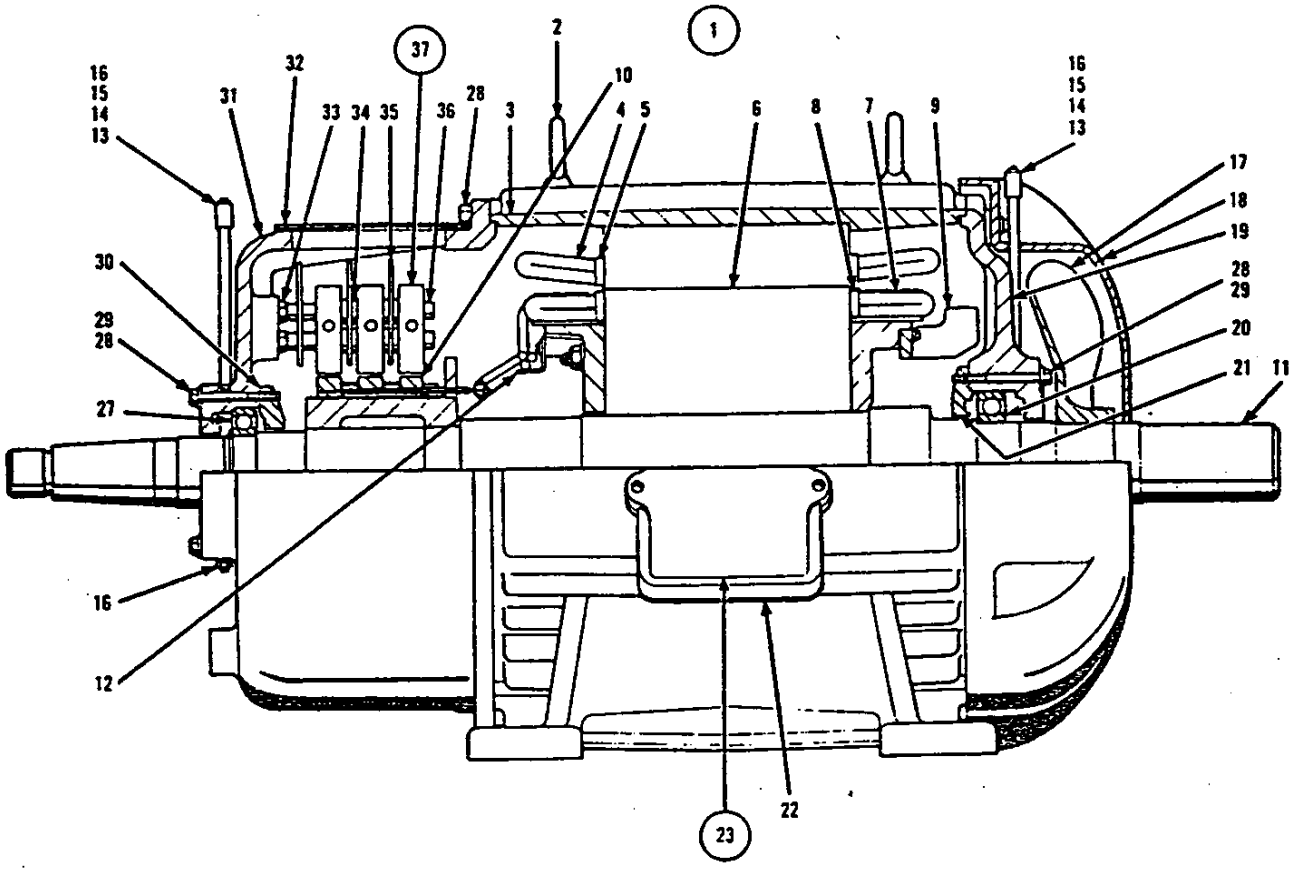
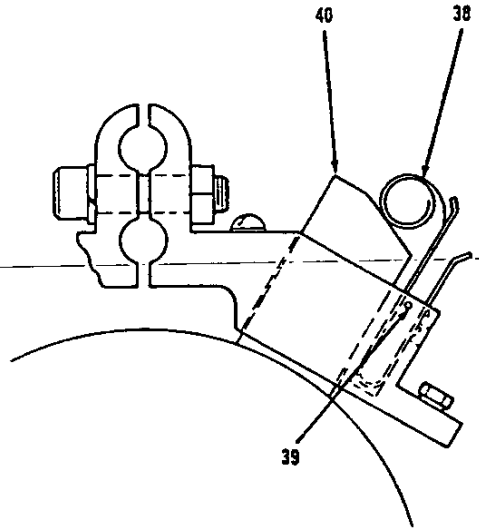
HEW 324 MOTOR ASSEMBLY
TROLLEY

ITEM		DESCRIPTION	PART NO.	QTY
		THIS MOTOR INCLUDES A BRAKE. SPECIFY WITH OR WITHOUT A BRAKE WHEN ORDERING NEW MOTOR		
1		MOTOR,HEW 324,10.00HP,230/460V,3PH,60HZ...	324M1328	1
		CONSISTS OF THE FOLLOWING ITEMS		
2		BEARING RETAINER, FRONT	572F620D1	1
3		BEARING, FRONT END	25T816D9	1
4		FRONT HEAD	572A117D1	1
5		BEARING, DRIVE END	25T816D9	1
6		STUD, BRUSHHOLDER	520H778	2
7		STUD INSULATOR	518F134D84	2
8	*	BRUSHHOLDER ASSEMBLY	9573F76-1	3
		EACH INCLUDES ITEMS 9 AND 10		
9	*	SPRING ASSEMBLY	17Z548D4	2
10		ROLL PIN, 0.078 DIA X 3/4 IN	19Z223D19	2
11	*	BRUSH, CARBON	73Q10D1	6
12		REAR HEAD	572E1370	1
13		BEARING RETAINER, REAR	572F620D1	1
14		BASE, TERMINAL BOX	587E4	1
15		COVER, TERMINAL BOX	514E76	1
16		GASKET, TERM. BOX COVER	520H218	1
17		COVER, BRUSH INSPECTION	514F1045D1	1
18		GASKET, TERMINAL BOX MOUNTING	520H775	1
19		JAM NUT, HEX, 3/8-16	2061V003	1
20		BOLT, SPECIAL (INSPECTION COVER)	520H809	1
21		WING NUT	520H773	1
22		EYE BOLT	520H774	1
23		SHOULDER BOLT	20Q1D12	1
24		BASIC HARDWARE KIT	521F6D1	1
200		STATOR ASSEMBLY	324M01304AF	1
		CONSISTS OF ITEMS 201-299		
201		STATOR COIL SET	324M01304F	1
202		SLOT INSULATION (FOR ONE SLOT)	570F81D42	54
217		LIFTING EYE BOLT	20H1027	2
300		ROTOR ASSEMBLY	3243M11603AF56R	1
		CONSISTS OF ITEMS 301-399		
301		ROTOR COIL SET	324M02056F	1
302		SLOT INSULATION (FOR ONE SLOT)	570F80D29	36
306		SHAFT ASSEMBLY	510E646D2F1	1
307		SLIP RING ASSEMBLY	9577A5-1	1
		FOLLOWING ITEMS NOT SHOWN		
		HEATER	80Z132D3	1

* - RECOMMENDED SPARE

ILLUSTRATION NO. HL-92
TYPE HEWY MOTOR





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HEW 404 MOTOR ASSEMBLY
BRIDGE 2 UNITS REQ'D.

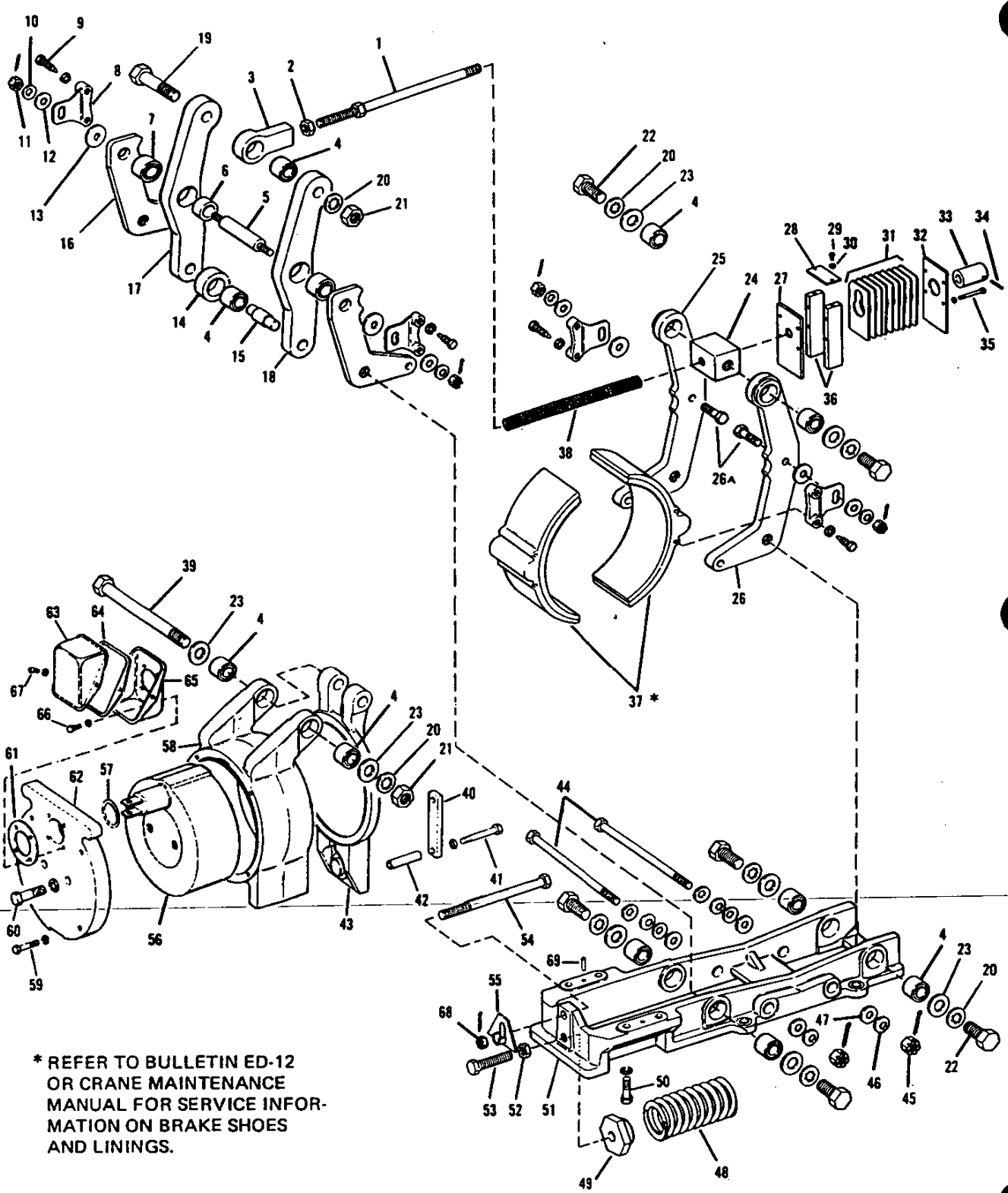
ITEM	DESCRIPTION	PART NO.	QTY
1	MOTOR HEW 404,30.00HP,230/460V,3PH,60HZ....	404M1189	1
	CONSISTS OF THE FOLLOWING ITEMS		
2	EYEBOLT	520H801	2
3	STATOR ASSEMBLY (INCLUDES ITEMS 4 AND 5) ..	404M01303AF	1
4	STATOR COIL SET	404M01303F	1
5	STATOR SLOT INSULATION SET	570F85D6	72
6	ROTOR ASSEMBLY (INCLUDES ITEMS 7-11)	4043M11616AF56R	1
7	ROTOR COIL SET	404M02056F	1
8	SLOT INSULATION (FOR 1 SLOT)	570F84D4	54
9	FAN	574F870	1
10	SLIP RING ASSEMBLY	9577A2-1	1
11	ROTOR SHAFT ASSEMBLY	510E618D2F1	1
	INCLUDES THE FOLLOWING PARTS		1
	LOCKWASHER, TABBED	18H7038D11	1
	LOCKNUT	20H1516D8	1
	SNAP RING	18Z2D61	1
12	RING, ROTOR SUPPORT	574F834D1	1
13	PIPE NIPPLE, 1/8 X 5-1/2 IN	2419V020	2
14	PIPE COUPLING, 1/8 IN	2409V001	2
15	GREASE FITTING, 1/8 IN	44Z1-D10	2
16	PIPE PLUG, 1/8 IN	2423V001	4
17	FAN, EXTERNAL	574E280F1	1
18	FAN GUARD	514E434	1
19	REAR HEAD	572E1355	1
20	REAR BEARING	25T816D12	1
21	RETAINER, REAR BEARING	572F600	1
22	GASKET, TERMINAL BOX MOUNTING	520H772	1
23	TERMINAL BOX ASSY (INC.ITEMS 24,25,26).....	514E472	1
24	GASKET, COVER	520H285	1
25	COVER, TERMINAL BOX	514E121	1
26	MACH. SCREW, RD HD, 1/4-20 X 1 IN	0860V114	2
	LOCKWASHER, 1/4 IN	3616V007	2
	HEX NUT, 1/4-20	2145V001	2
27	FRONT BEARING	25T816D16	1
28	CAPSCREW, HEX HD, 3/8-16 X 3-1/2 IN	0826V051	12
	CAPSCREW, HEX HD, 3/8-16 X 3-1/4 IN	0826V050	8
29	LOCKWASHER, 3/8 IN	2616V009	20
30	RETAINER, FRONT BEARING	572F604	1
31	FRONT HEAD	572A115D1	1
32	COVER, BRUSH INSPECTION	514F1047D1	1
	COVER BOLT, SPECIAL	520H804	2

HEW 404 MOTOR ASSEMBLY
BRIDGE 2 UNITS REQ'D.

ITEM		DESCRIPTION	PART NO.	QTY
		SHOULDER BOLT	20Q1-D20	2
		EYE BOLT	520H801	2
		WING NUT	20H1067	2
33		STUD, BRUSHHOLDER	520H723	2
		HEX JAM NUT, 1/2-13	2161V005	2
34		SPACER, BRUSHHOLDER	518F134D7	8
35		SEPARATOR, BRUSHHOLDER	577H741	2
36		INSULATOR, BRUSHHOLDER STUD	518F134D12	2
37	*	BRUSHHOLDER ASSEMBLY	73Q6	3
		EACH INCLUDES ITEMS 38 AND 39		
38	*	SPRING (W/BACKUP PLATE)	17Z548D3	2
39		ROLL PIN, 0.078 X 3/4 IN	19Z223D19	2
40	*	BRUSH, CARBON	73Q10D1	6
		HEATER NOT SHOWN	80Z132D1	1

* - RECOMMENDED SPARE

ILLUSTRATION NO. CB-35
SBE BRAKE ASSEMBLY



* REFER TO BULLETIN ED-12 OR CRANE MAINTENANCE MANUAL FOR SERVICE INFORMATION ON BRAKE SHOES AND LININGS.

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WHEN ORDERING PARTS ALWAYS GIVE MODEL AND MACHINE SERIAL NUMBER

REV. 8/80

19SBE BRAKE ASSEMBLY
MAIN HOIST

ITEM		DESCRIPTION	PART NO.	QTY
		19SBE BRAKE ASSEMBLY ..... INCLUDES ITEMS 1 THRU 69	19SBE800ASC1	1
1		BRAKE ROD	20F347D3	1
2		JAM NUT, 1-1/4-12 UNF, PLT	2165V012	1
3		PIVOT LINK	15F509D1	1
4	*	NEEDLE BEARING, SEALED	25Z932D15	10
5		SHAFT	10F9105D3	1
6		SPACER	18H8078D9	2
7	*	NEEDLE BEARING, SEALED	25Z932D15	2
8		SHOE HOLDER	15E704	4
9		BOLT, SHOE HOLDER	20F318D10	8
		LOCKWASHER, PLT, 3/4 IN	3616V015	8
10		BELLEVILLE WASHER, 1 ID X 0.078 IN THICK .	17Z286D22	4
11		NUT, SLOTTED HEX, 7/8-9	2169V009	4
12		PLAIN WASHER, 7/8 IN	3632V010	4
13		NOT USED		
14		ROLLER	13F3084D3	1
15		SHAFT	10F9079D9	1
16		LINK	6E285	2
17		LINK	6E283D2	1
18		LINK	6E283D1	1
19		CAPSCREW, HEX HD, 1-3/8-12 X 7-1/2, GR 5 .	20T8394D14	1
20		LOCKWASHER, PLT, INT. TOOTH, 1-3/8 IN	18Z733D24	8
21		HEX NUT, 1-3/8-12 UNF	2149V013	2
22		CAPSCREW, HEX HD, 1-3/8-12 X 2-1/2, GR 5 .	20T8394D1	6
23		PLAIN WASHER, PLT, 1-3/8 IN	3611V017	4
24		BLOCK, PIVOT	15F508	1
25		LINK	6E284	1
26		LINK	6E284	1
		BOLT, SHOE HOLDER PIVOT	20F314D13	2
27		END WALL, SPACER HOUSING	15F511D2	1
28		COVER, SPACER HOUSING	87H40D3	1
29		MACH. SCREW, PAN HD, PLT, 10-24 X 1/2 IN .	0862V096	2
30		LOCKWASHER, PLT, NO.10	3616V005	2
31		SPACER, ADJUSTMENT	18F1940	11
32		END WALL, SPACER HOUSING	15F511D1	1
33		STOP, BRAKE ROD	29F4379	1
34		SPRING PIN, 1/4 IN DIA X 2-1/2 IN LG	19Z223D121	1
35		MACH.SCREW,HEX HD,PLT,5/16-18 X 3-1/4 IN .	0826V032	4
		LOCKWASHER, PLT, 5/16 IN	3616V008	4
36		SIDEWALL, SPACER HOUSING	15H510	2

* - RECOMMENDED SPARE

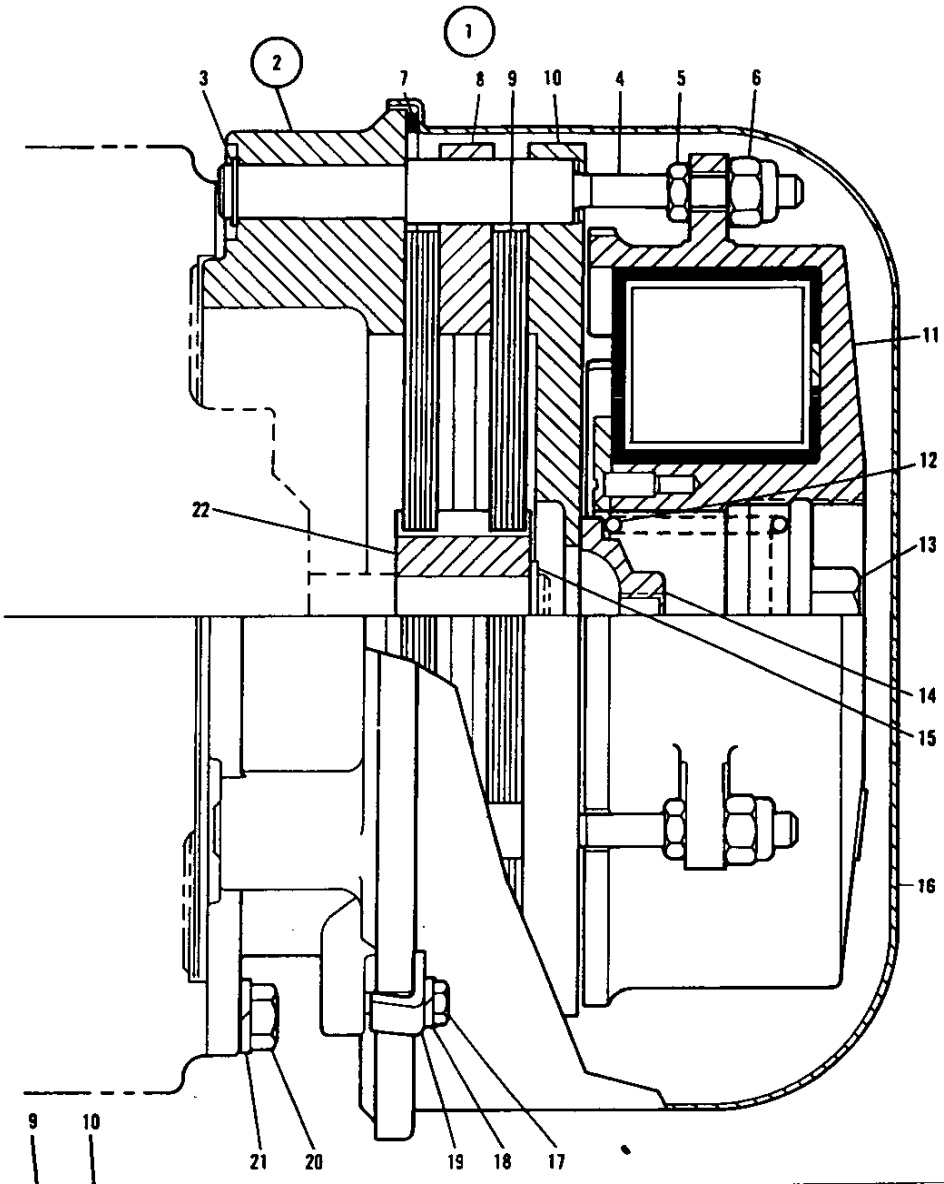
19SBE BRAKE ASSEMBLY
MAIN HOIST

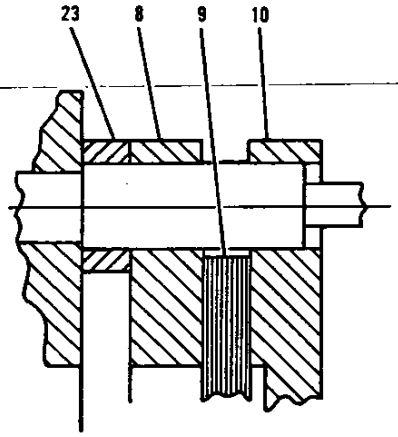
ITEM		DESCRIPTION	PART NO.	QTY
37	*	SHOE ASSEMBLY	915F84-F5	2
38		SPRING, BRAKE ROD	17Z595	1
39		CAPSCREW, HEX DR HD, 1-3/8-12 X 12 IN	20T8394D23	1
40		BAR	15F494D3	1
41		CAPSCREW, HEX HD, 5/8-11 X 5-1/2, GR. 5	20Z711D108	2
		LOCKWASHER, PLT, 5/8 IN	3616V013	2
42		SPACER	18H8078D10	2
43		ARMATURE	81A92	1
44		BOLT, BASE FRICTION STOP	20F381D1	2
45		NUT, SLOTTED HEX, 1-8 UNC	2169V010	2
46		BELLEVILLE WASHER, 1 ID X 0.098 IN THICK	17Z286D23	8
47		WASHER, PLAIN, 1 IN	3632V011	4
48	*	SPRING, TORQUE	17Z596	1
49		SEAT, TORQUE SPRING	18H8079D5	1
50		CAPSCREW, HEX HD, 3/4-10 X 2-1/2 IN	0626V134	4
		LOCKWASHER, 3/4 IN	3615V015	4
51		BASE	15A57	1
52		HEX NUT, 1-14 N.S.	2149V010	1
53		BOLT, SPRING ADJUSTING	20F318D9	1
54		BOLT, ARMATURE	20F314D14	1
55		SPACER, ARMATURE	18F1866D3	1
56	*	COIL, MAGNET	75A35D1	1
57		O-RING	45Z91D159	1
58		MAGNET CASE	81A91	1
59		CAPSCREW, HEX HD, PLT, 5/8-11 X 3-1/2 IN	0826V121	4
		LOCKWASHER, PLT, 5/8 IN	3616V013	4
60		CAPSCREW, HEX HD, 3/4-10 X 2-1/2 IN	0626V134	2
		LOCKWASHER, 3/4 IN	3615V015	2
61		GASKET	20Z995D2	1
62		END CAP	15E705D1	1
63		COVER, TERM. BOX	87Z162D3	1
64		GASKET	20Z996D2	1
65		TERM. BOX	87Z161D6	1
66		CAPSCREW, HEX HD, PLT,1/2-13 X 1/2 IN	0826V073	4
		LOCKWASHER, PLT, 1/2 IN	3616V011	4
67		MACH. SCREW, RD HD, PLT, 1/4-20 X 3/8 IN	0860V107	2
		LOCKWASHER, PLT, 1/4 IN	3616V007	2
68		NUT, SLOTTED HEX, 5/8-11 UNC	2069V009	1
69		SPRING PIN, 1/4 IN DIA X 1 IN LG	19Z223D111	2

THE BRAKE WHEEL (ITEM 70) IS FURNISHED

* - RECOMMENDED SPARE

ILLUSTRATION DB-3
BRAKE ASSEMBLY





NOTE ARRANGEMENT
FOR SINGLE DISC
BRAKE

Fig. 4 & 5 Only

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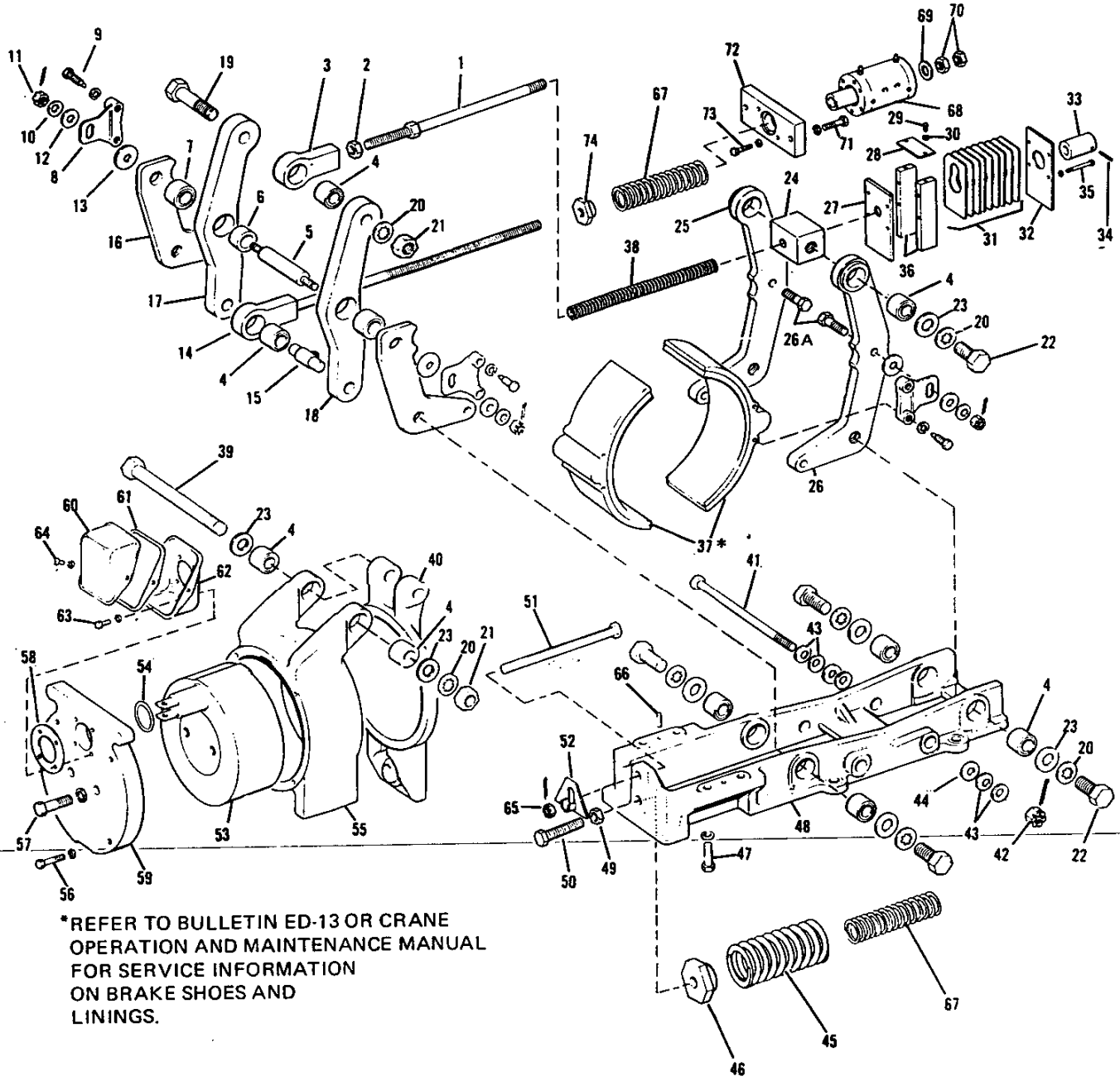
ADJUSTABLE MAGNETIC DISC BRAKE
TROLLEY

ITEM		DESCRIPTION	PART NO.	QTY
		NOTE: ITEMS 11 AND 12 ARE NOT INCLUDED WHEN ORDERING A COMPLETE BRAKE. THESE ITEMS MUST BE ORDERED SEPARATELY.		
1		BRAKE ASSEMBLY,TYPE CD-4A	100A7238-1	1
2		COLLAR SUBASSEMBLY ..... INCLUDES ITEMS 3 THRU 6	918E11-1	1
3		SNAP RING	18Z2D128	3
4		MOUNTING PIN	19F202	3
5		HEX NUT, JAM, PLT, 1/2-13	2161V005	3
6		HEX NUT, SELF LOCKING, 1/2-13	20H1614D6	3
7		GASKET, 1/8 X 1/4 X 38 IN, SELF ADHESIVE .	------	1
8		DISC PLATE	315F132	1
9	*	FRICTION DISC	315F108	2
10		ARMATURE	81E41	1
11	*	POT ASSEMBLY	981A10-5	1
12		SPRING	17Z140	1
13		ADJUSTING SCREW	20F410	1
14		SPRING GUIDE	18H5717	1
15		SNAP RING	18Z2D27	1
16		COVER	314F357	1
17		CAPSCREW, HEX HD, 1/4-20 X 1-1/4 IN	0826V007	4
18		LOCKWASHER, 1/4 IN, EXTRA DUTY	3643V009	4
19		LATCH, COVER	306H617	4
20		CAPSCREW, HEX HD, 7/16 X 1 IN	0826V059	3
21		LOCKWASHER,7/16 IN, EXTRA DUTY	3643V012	3
22		DISC HUB	313F839	1

* - RECOMMENDED SPARE

ILLUSTRATION NO. CB-36
SBEM BRAKE ASSEMBLY



*REFER TO BULLETIN ED-13 OR CRANE OPERATION AND MAINTENANCE MANUAL FOR SERVICE INFORMATION ON BRAKE SHOES AND LININGS.

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REV. 10/80

10SBEM BRAKE ASSEMBLY
BRIDGE 2 UNITS REQ'D.

ITEM		DESCRIPTION	PART NO.	QTY
		10SBEM BRAKE ASSEMBLY ..... INCLUDES ITEMS 1 THRU 74	10SBEM200ASC1	1
1		BRAKE ROD	20F321	1
2		JAM NUT, 5/8-11 UNC, PLT	2161V007	1
3		PIVOT LINK	15F486	1
4	*	NEEDLE BEARING, SEALED	25Z932D4	10
5		SHAFT	10F9060	1
6		SPACER	18H8078D3	1
7	*	NEEDLE BEARING, SEALED	25Z932D4	2
8		SHOE HOLDER	15F483	4
9		BOLT, SHOE HOLDER	20F318D4	8
		LOCKWASHER, PLT, 3/8 IN	3615V009	8
10		BELLEVILLE WASHER, 1/2 ID X 0.049 IN THK .	17Z286D14	4
11		NUT, SLOTTED HEX, 1/2-13 THD	2169V005	4
12		PLAIN WASHER, 1/2 IN, HVY	3632V005	4
13		NOT USED		
14		LINK	6F761	1
15		SHAFT	10F9079D3	1
16		LINK	6E261	2
17		LINK	6E259D1	1
18		LINK	6E259D2	1
19		CAPSCREW, HEX HD, 3/4-18 X 3-1/4 IN, GR 5.	20Z1273D208	1
20		LOCKWASHER, PLT, INT. TOOTH, 3/4 IN	18Z2212D8	8
21		HEX NUT, 3/4-18 THD	2149V008	2
22		CAPSCREW, HEX HD, 3/4-16 X 1-3/4 IN, GR 5.	20Z1273D131	6
23		PLAIN WASHER, PLT, 3/4 IN	3632V009	4
24		BLOCK, PIVOT	15F484	1
25		LINK	6E263D2	1
26		LINK	6E263D1	1
		BOLT, SHOE HOLDER PIVOT	20F314D4	2
27		END WALL, SPACER HOUSING	15F485D2	1
28		COVER, SPACER HOUSING	87H43	1
29		MACH. SCREW, PAN HD, PLT, 10-24 X 1/2 IN .	0862V096	2
30		LOCKWASHER, PLT, NO.10	3616V005	2
31		SPACER, ADJUSTMENT	18F1842	15
32		END WALL, SPACER HOUSING	15F485D1	1
33		STOP, BRAKE ROD	29H1178	1
34		SPRING PIN, 3/16 IN DIA X 1-1/8 IN LG	19Z223D88	1
35		MACH. SCREW, HEX HD, 10-24 X 2-1/4 IN	0846V107	4
		LOCKWASHER, PLT, NO.10	3616V005	4
36		SIDEWALL, SPACER HOUSING	15H540	2

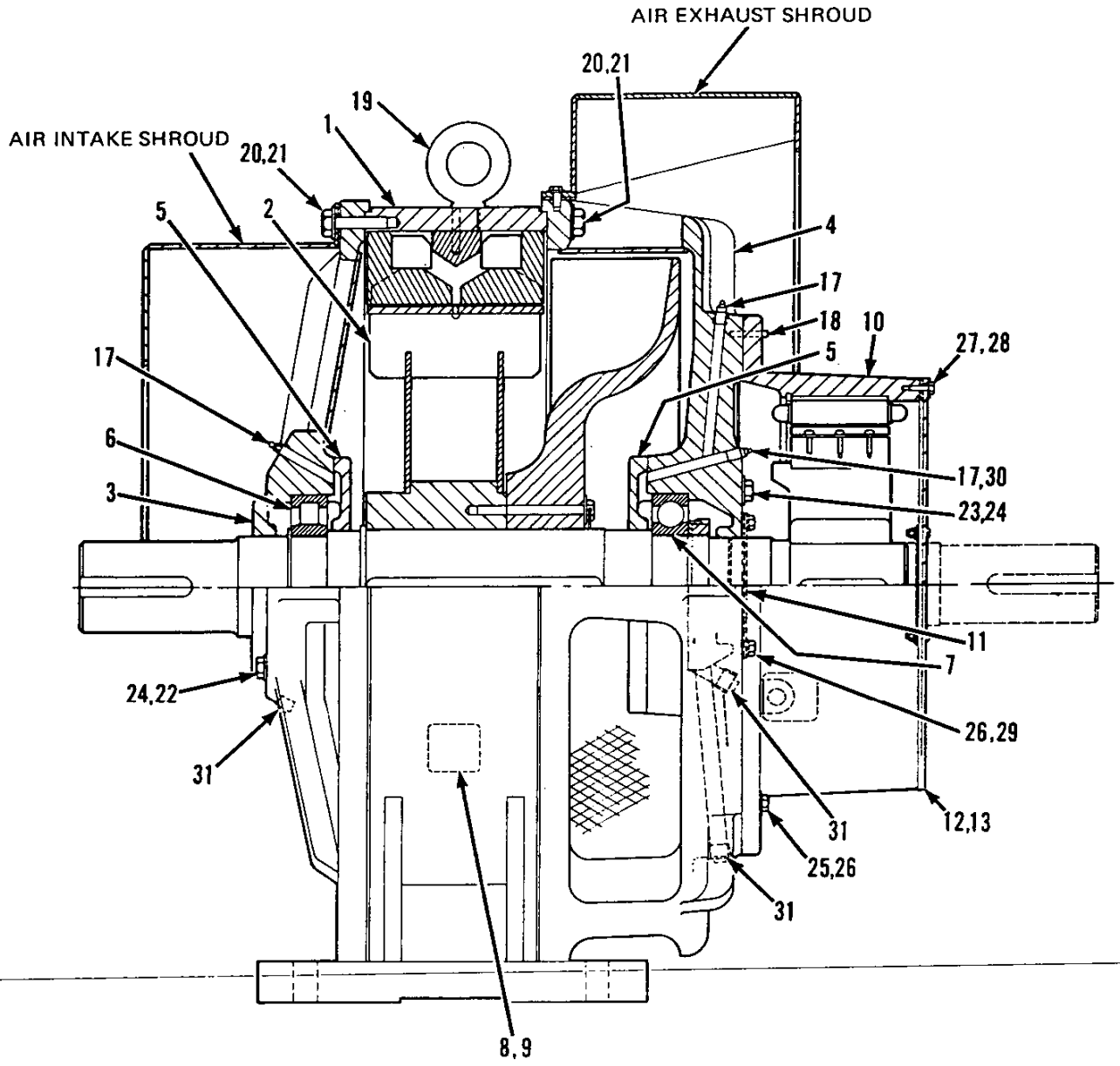
* - RECOMMENDED SPARE

10SBEM BRAKE ASSEMBLY
BRIDGE 2 UNITS REQ'D.

ITEM		DESCRIPTION	PART NO.	QTY
37	*	SHOE ASSEMBLY	915F84-F2	2
38		SPRING, BRAKE ROD	17Z562	1
39		CAPSCREW, HEX HD, 3/4-16 X 7-1/2 IN, GR 5.	20Z1273D540	1
40		ARMATURE	81A86	1
41		BOLT, BASE FRICTION STOP	20F314D5	2
42		NUT, SLOTTED HEX, 1/2-13 THD	2169V005	2
43		BELLEVILLE WASHER, 1/2 ID X 0.059 IN THK	17Z286D15	8
44		PLAIN WASHER, 1/2 IN, HVY	3632V005	4
45	*	SPRING, TORQUE	17Z561	1
46		SEAT, TORQUE SPRING	18H8079D2	1
47		CAPSCREW, HEX HD, 1/2-13 X 1-1/2 IN	0626V079	4
		LOCKWASHER, 1/2 IN	3615V011	4
48		BASE	15A48	1
49		HEX NUT, 5/8-11 THD	2145V007	1
50		BOLT, SPRING ADJUSTING	20F318D3	1
51		BOLT, ARMATURE	20F314D6	1
52		SPACER, ARMATURE	18H8137	1
53	*	COIL, MAGNET	75A5D1	1
54		O- RING	45Z91D145	1
55		MAGNET CASE	81A85	1
56		CAPSCREW, HEX HD, 5/16-18 X 1-1/2 IN	0826V025	4
		LOCKWASHER, PLT, 5/16 IN	3616V008	4
57		CAPSCREW, HEX HD, 5/8-11 X 1-3/4 IN	0826V114	2
		LOCKWASHER, PLT, 5/8 IN	3616V013	2
58		GASKET	20Z995D2	1
59		END CAP	15E695D1	1
60		COVER, TERM. BOX	87Z162D2	1
61		GASKET	20Z996D2	1
62		TERM. BOX	87Z161D5	1
63		CAPSCREW, HEX HD, 3/8-16 X 1/2 IN	0826V037	4
		LOCKWASHER, PLT, 3/8 IN	3616V009	4
64		MACH. SCREW, RD HD, 1/4-20 X 3/8 IN	0860V107	2
		LOCKWASHER, PLT, 1/4 IN	3616V007	2
65		NUT, SLOTTED HEX, 1/2-13 THD	2169V005	1
66		PIN SPRING, 1/4 IN DIA X 1 IN LG	19Z223D111	2
67		SPRING	17Z563	2
68	*	WHEEL CYLINDER (SOLD ONLY AS COMPLETE ASSEMBLY)	100A6115-1	2 1
69		PLAIN WASHER, PLT, 5/8 IN	3631V011	1
70		HEX NUT, PLT, 5/8-11 THD	2145V007	2
71		CAPSCREW, HEX HD, 3/8-16 X 1-1/4 IN	0826V042	2

* - RECOMMENDED SPARE

ILLUSTRATION CB-18A
MAGNETORQUE BRAKE

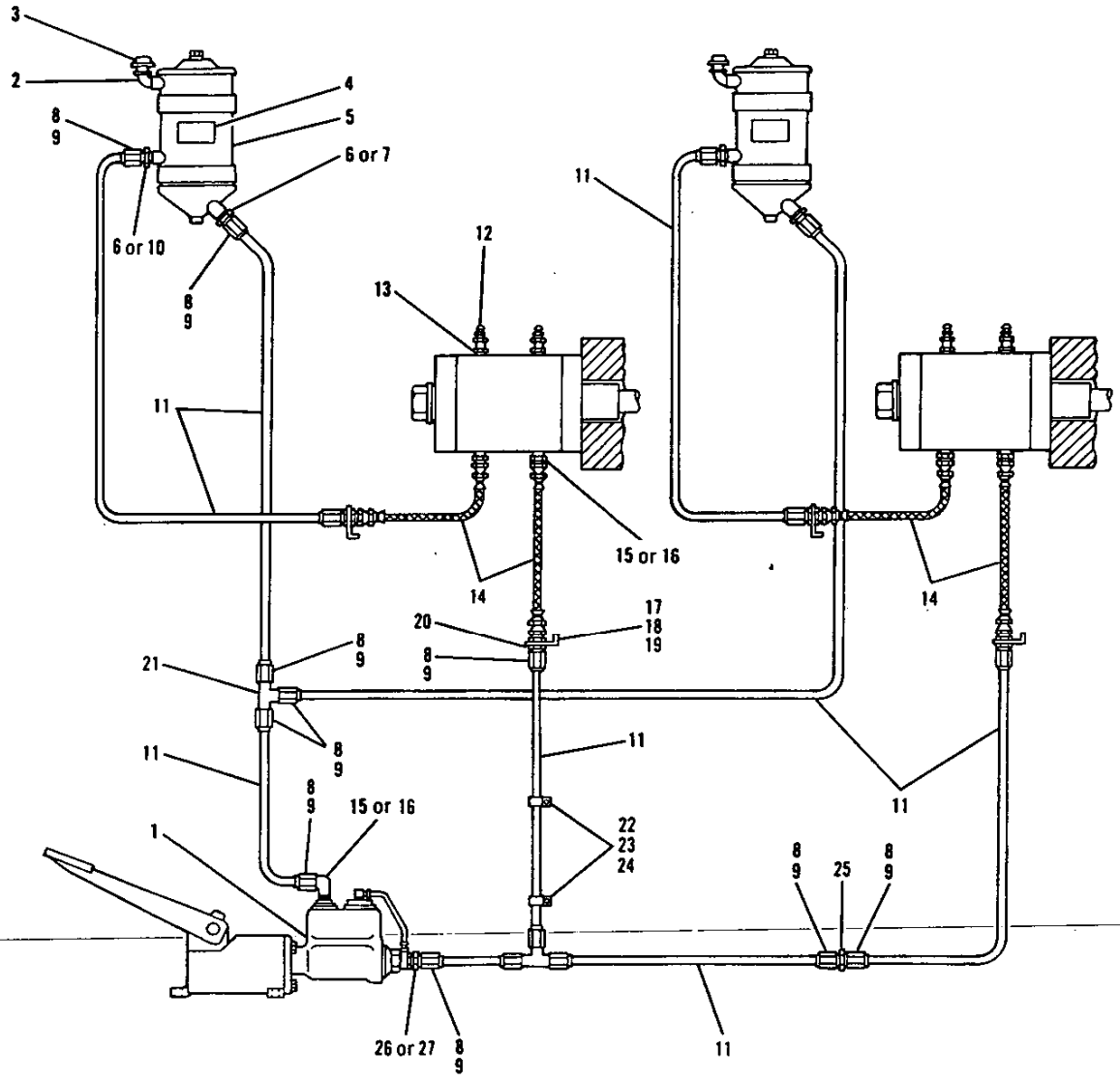


MODEL 2408A MAGNETORQUE BRAKE ASSEMBLY
215028-75 MAIN HOIST

ITEM		DESCRIPTION	PART NO.	QTY
1		FIELD ASSEMBLY	9571A89-1	1
2		ROTOR ASSEMBLY (INCLUDES THE FOLLOWING)	9574E37-4	1
		FAN	574E563	1
		CAPSCREW, HEX HD, 1/2-13 X 2-3/4 IN	0626V084	6
		PLAIN WASHER, 1/2 IN	3631V009	6
		SOFT WIRE NO. 16 GA. X 2 FT. LG.	------	1
		SHAFT ASSEMBLY	510E1348-F1	1
		INCLUDES KEYS AND THE FOLLOWING		
		LOCKNUT	20Z3D20	1
		LOCKWASHER	18Z1D20	1
		RETAINING RING	18Z2D14	1
3		FRONT HEAD	572E1533	1
4		REAR HEAD	572E1534D2	1
5		BEARING CAP, INNER	572F740	2
6	*	FRONT BEARING	25Z100D20	1
7	*	REAR BEARING	25Z451D23	1
8		CONDUIT NIPPLE	20H2872D7-2	1
9		TERMINAL BOX	95871-10	1
10		NOT USED		
11		NOT USED		
12		NOT USED		
13		NOT USED		
14		LUBRICATION INSTRUCTION PLATE	532H556	1
15		NAMEPLATE	32H397	1
16		DRIVE SCREW, NO. 4 X 1/4 IN	20Z42D2	6
17		LUBE FITTING, 1/4 IN	44Z1D14	2
18		NOT USED		
19		EYEBOLT, 1 IN	20Z517D26	1
20		CAPSCREW, HEX HD, 5/8-11 X 2 IN	20Z517D26	12
21		LOCKWASHER, 5/8 IN	3615V013	12
22		CAPSCREW HEX HD, 1/2-13 X 3-1/2 IN	0626V087	4
23		CAPSCREW, HEX HD, 1/2-13 X 4 IN	0626V089	4
24		LOCKWASHER, 1/2 IN	3615V011	8
		ITEMS 25 THRU 30 ARE NOT USED		
31		PIPE, GALV, 1/2 IN	------	2
32		HYLOMAR COMPOUND	21Z587D2	(
		FOLLOWING ITEMS ARE NOT SHOWN		
33		SHROUD	527A22D1	1
34		SHROUD	527A22D2	1
35		SCREW, HEX HD, SELF TAP, 1/4 X 1 IN	20Z41D11	4
36		LOCKWASHER, 1/4 IN	3616V007	4

* - RECOMMENDED SPARE

ILLUSTRATION NO. CB-37
HYDRAULIC BRAKE SYSTEM
TWO-BRAKE, ONE-MASTER



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P&H

100A6497

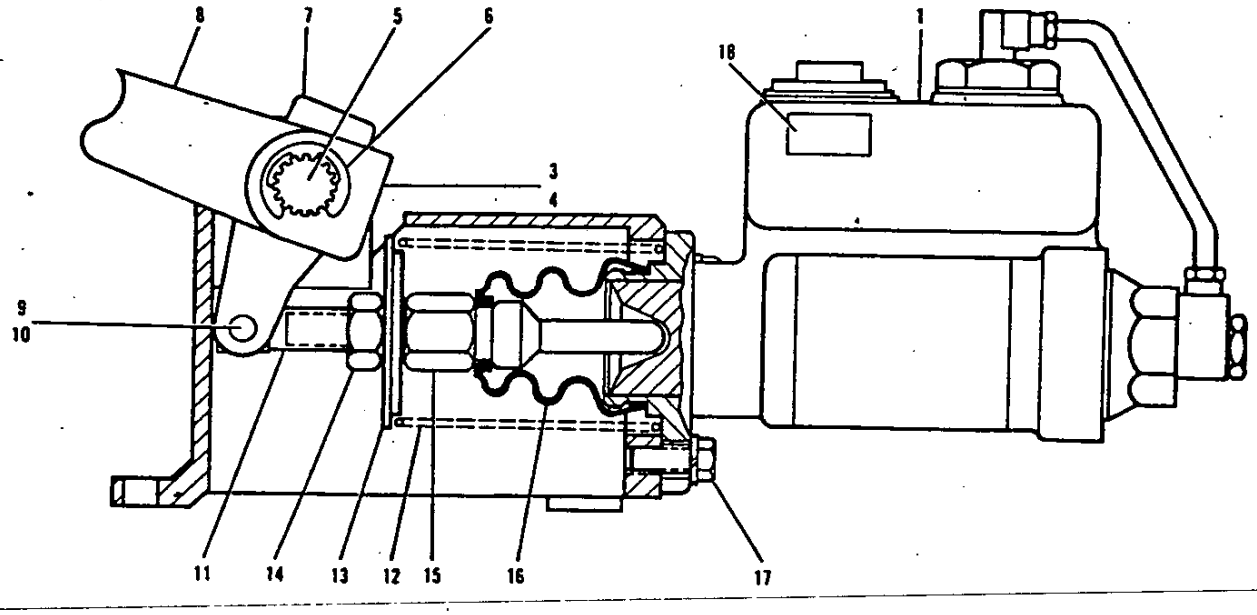
HYDRAULIC BRAKE SYSTEM
100A6497-1

ITEM		DESCRIPTION	PART NO.	QTY
1		MASTER CYLINDER ASSEMBLY	100A6569-1	1
		SEE ILLUSTRATION C-58A FOLLOWING		1
2		STREET ELBOW, RED, 3/4 X 1/2 X 90 DEG	2442V008	2
3		AIR FILTER	47Z50	2
4		WARNING DECAL	32Q114	2
5		OIL RESERVOIR	27Z426	2
6		MALE CONNECTOR,3/8 TUBE,1/2 IN PIPE THD ..	44Z811D5	AR
7		MALE ELBOW,45DEG,3/8 TUBE,1/2 IN PIPE THD.	2414V004	AR
8		NUT,3/8 IN ,BRASS,37DEG JIC FLARE	20Z1143D1	18
9		SLEEVE,3/8 IN BRASS,37DEG JIC FLARE	18Z1603D1	18
10		MALE ELBOW,90DEG,3/8 TUBE,1/2 IN PIPE THD.	2412V019	AR
11		COPPER TUBING,3/8 O.D.X0.035 IN WALL (LENGTH AS REQUIRED).....	------	AR
12		BLEEDER FITTING	46Z216	4
13		PIPE BUSHING,1/4 IN M X 1/8 IN F, BRASS ..	2401V001	4
14	*	HOSE ASSEMBLY	44P194D1	4
15		MALE CONNECTOR,3/8 TUBE,1/4 IN PIPE THD ..	44Z811D2	AR
16		MALE ELBOW,90DEG,3/8 TUBE,1/4 IN PIPE THD.	2412V017	AR
17		BRACKET	16H2418D1	4
18		CAPSCREW, HEX HD, PLT, 5/16-18 X 1 IN	0826V023	8
19		LOCKWASHER, PLT, 5/16 IN	3616V008	8
20		BULKHEAD UNION,TUBE-TO-TUBE,3/8 IN ,37 DEG JIC FLARE	44A1042D5	4
21		UNION TEE,3/8 IN ,BRASS,37DEG JIC FLARE ..	2429V003	2
22		CABLE CLIP	32Z114D4	AR
23		CAPSCREW, HEX HD, PLT,1/4-20 X 1 IN	0826V006	AR
24		LOCKWASHER, PLT, 1/4 IN	3616V007	AR
25		UNION,3/8 TUBE,1/8 IN PIPE THD.....	44Z1043D1	AR
26		MALE CONNECTOR,3/8 TUBE,1/8 IN PIPE THD...	44Z811D3	AR
27		MALE ELBOW 90DEG,3/8 TUBE,1/8 IN PIPE THD.	2414V016	AR
28		BLEEDER HOSE,5/16 OD X 3/16 ID X 24 IN ...	44Z683	2
		(NOT ILLUSTRATED)		

AR-AS REQUIRED. QUANTITY VARIES ACCORDING TO LENGTH OF HYDRAULIC TUBING RUNS.

* - RECOMMENDED SPARE

ILLUSTRATION NO. C-58A
BRAKE MASTER CYLINDER ASSEMBLY

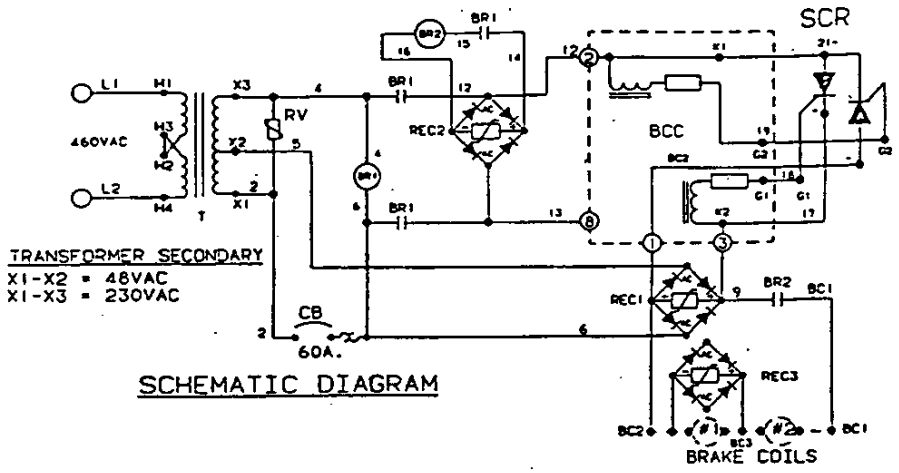


HYDRAULIC MASTER CYLINDER
100A6569-1

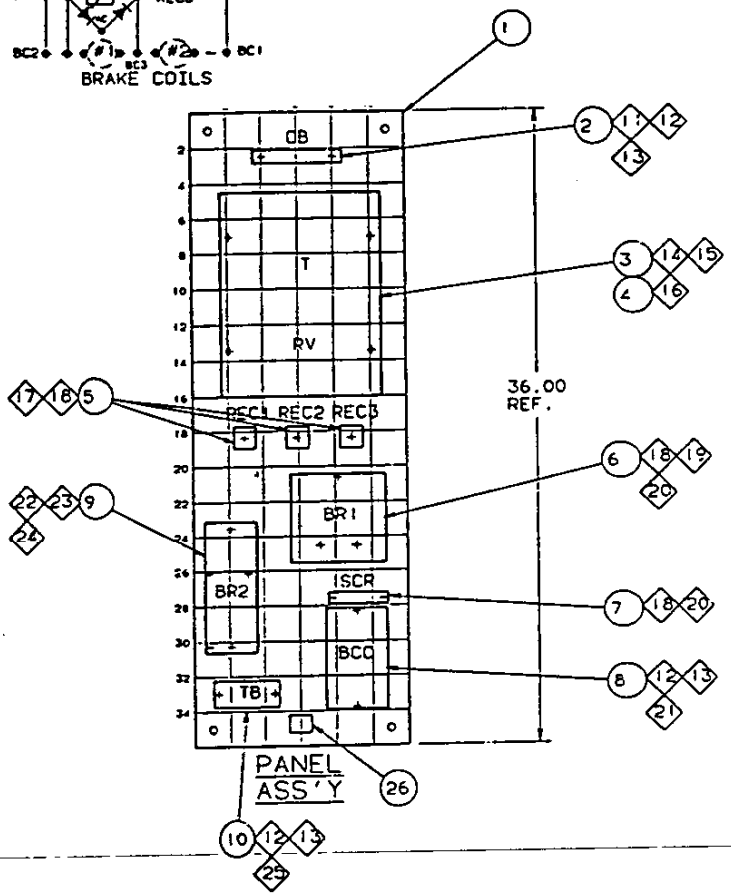
ITEM		DESCRIPTION	PART NO.	QTY
1	*	CYLINDER ASSEMBLY ..... INDIVIDUAL PARTS NOT FURNISHED. ORDER COMPLETE MASTER CYLINDER.	38Q38D1	1
2		BASE (INCLUDES ITEM 3)	16E5259	1
3		BUSHING	5H2598	2
4		SLEEVE	18H7196	2
5		PIN	19H3086	1
6		SNAP RING	18Z2D151	2
7		ARM	6H642D1	1
8		LEVER	6E184	1
9		SPRING PIN,5/32 IN DIA X 7/8 IN LG	19Z223D68	1
10		PIN	19F79D327	1
11		BOLT,SPECIAL	20F372	1
12	*	SPRING,PEDAL RETURN	17Z590	1
13		SPRING GUIDE	18F1919	1
14		HEX NUT, PLT, 9/16-18	2145V006	1
15		ROD,PUSH	20Z1092	1
16	*	BOOT	45Z340	1
17		CAPSCREW, HEX HD, PLT, 3/8-16 X 1 IN	0826V041	3
		LOCKWASHER, PLT, EXTRA DUTY, 3/8 IN	3643V011	3
18		DECAL	32Q114	1

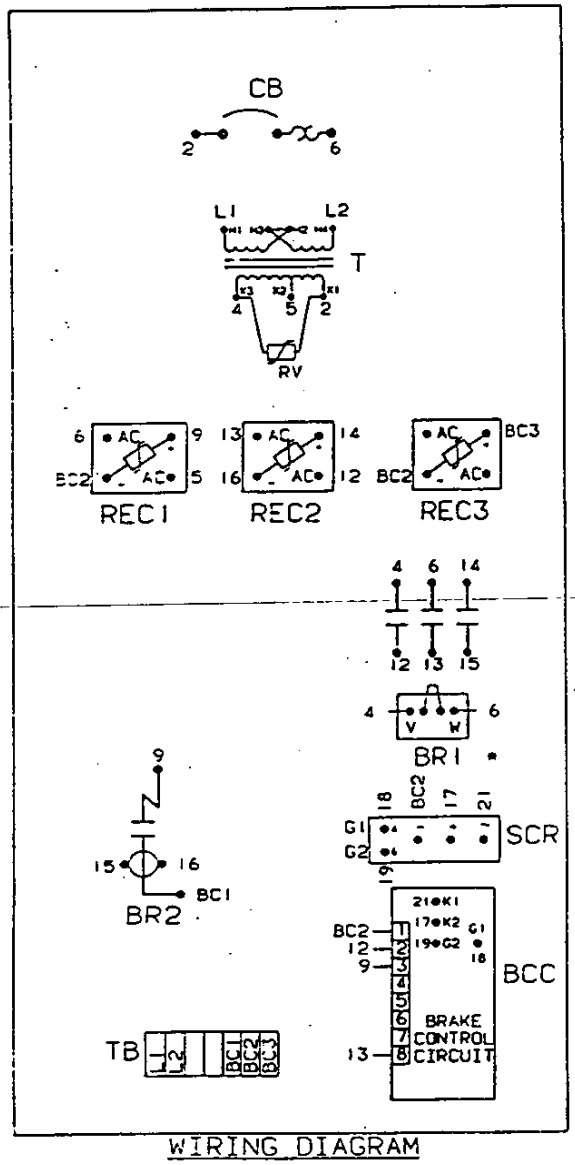
* - RECOMMENDED SPARE

979A1400F6



SCHEMATIC DIAGRAM





WIRING DIAGRAM

WIRE COLOR & SIZE	WIRE NO.	DEVICE LOCATION
#14 BLACK	L1	TB,T
#14 BLACK	L2	TB,T
#14 RED	2	CB,T
#14 RED	4	T,BR1,BR1
#14 RED	5	T,REC1
#14 RED	6	CB,REC1,BR1,BR1
#14 BLUE	9	REC1,BR2,BCC
#14 RED	12	REC2,BR1,BCC
#14 RED	13	REC2,BR1,BCC
#14 BLUE	14	REC2,BR1
#14 BLUE	15	BR1,BR2
#14 BLUE	16	REC2,BR2
MODULE LEAD	17	SCR,BCC
MODULE LEAD	18	SCR,BCC
MODULE LEAD	19	SCR,BCC
MODULE LEAD	21	SCR,BCC
#14 BLUE	BC1	BR2,TB
#14 BLUE	BC3	TB,REC3
#14 BLUE	BC2	TB,REC1,BCC,SCR,REC3

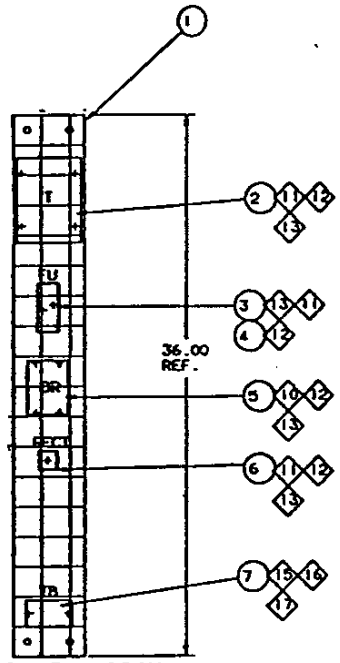
ALL WIRE TO BE TYPE THHN/THWN P&H 250.

BRAKE RECTIFIER
979A1400-6 MAIN HOIST

ITEM		DESCRIPTION	PART NO.	QTY
1		PANEL	779E10D12	1
2		CIRCUIT BREAKER, 60A (CB)	79Z4145D10	1
3	*	TRANSFORMER, 3.00 KVA (T)	75Q126D1	1
4		VARISTOR (RV)	80H1050D1	1
5	*	RECTIFIER (REC)	75Z1091	1
6	*	BRAKE RELAY (BR)	479U186D11	1
		SEE ILLUST. FE-12-186 FOLLOWING		
7	*	SCR/SCR POWER MODULE	75Q129D4	1
8	*	BRAKE CONTROL CIRCUIT	100E4896-4	1
9		CONTACTOR, SIZE 1, 25A (BR2)	U25A200FXX1XXX	1
		SEE ILLUST. CC-92-1 FOLLOWING		
10		TERMINAL BOARD	79E4164D7-7	1
11		SCREW, MACH, PAN HD, 8-32 X 5/8 IN	0862V079	2
12		LOCKWASHER, NO.8	3616V004	6
13		PLAIN WASHER, NO.8	3631V003	6
14		CAPSCREW, HEX HEAD, 3/8-16 X 3/4 IN	0826V039	4
15		LOCKWASHER, 3/8 IN	3616V009	4
16		PLAIN WASHER, 3/8 IN	3632V004	4
17		MACH SCREW, PAN HEAD, 10-24 X 7/8 IN	0862V100	3
18		LOCKWASHER, NO.10	3616V005	8
19		PLAIN WASHER, NO.10	3631V004	3
20		SCREW, MACH, PAN HD, 10-24 X 3/4 IN	0862V099	5
21		SCREW, MACH, PAN HD, 8-32 X 7/8 IN	0862V081	2
22		CAPSCREW, HEX HEAD, 1/4-20 X 1-1/2 IN	0826V008	3
23		LOCKWASHER, 1/4 IN	3616V007	3
24		PLAIN WASHER, 1/4 IN	3632V002	3
25		SCREW, MACH, PAN HD, 8-32 X 1/2 IN	0862V077	2
26		DECAL, "DANGER HIGH VOLTAGE"	32Z1364D2	1

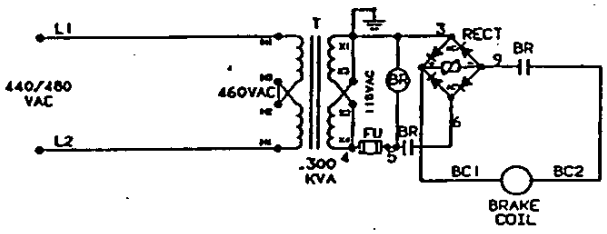
* - RECOMMENDED SPARE

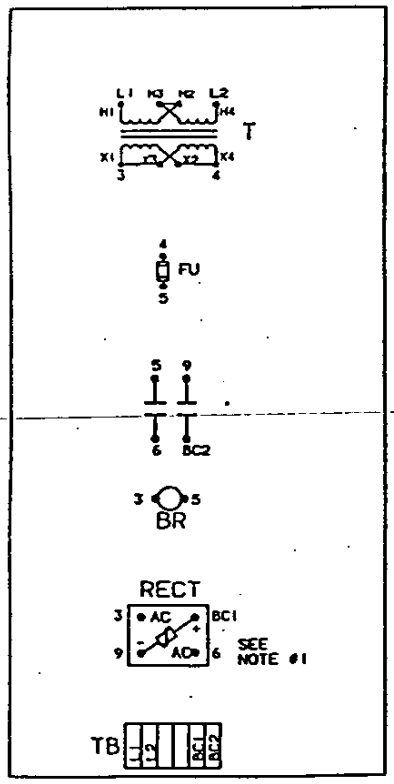
CONTROL PANEL, BRAKE, BRIDGE - 979A596F1



PANEL ASS'Y

SCHEMATIC DIAGRAM





WIRING DIAGRAM

WIRE COLOR & SIZE	WIRE NO.	DEVICE LOCATION
#14 BLACK	L1	TB
#14 BLACK	L2	TB
#14 BLACK	BC1	RECT, TB
#14 BLACK	BC2	BR, TB
#14 GREEN	⏚	TO PANEL GROUND
#14 WHITE	3	BR, RECT
#14 RED	4	FU
#14 RED	5	FU, BR, BR
#14 RED	6	BR, RECT
#14 BLACK	9	BR, RECT

⬡ = EXTERNAL CONNECTIONS

ALL WIRE TO BE TYPE "THHN" PER SPEC #250

NOTE #1

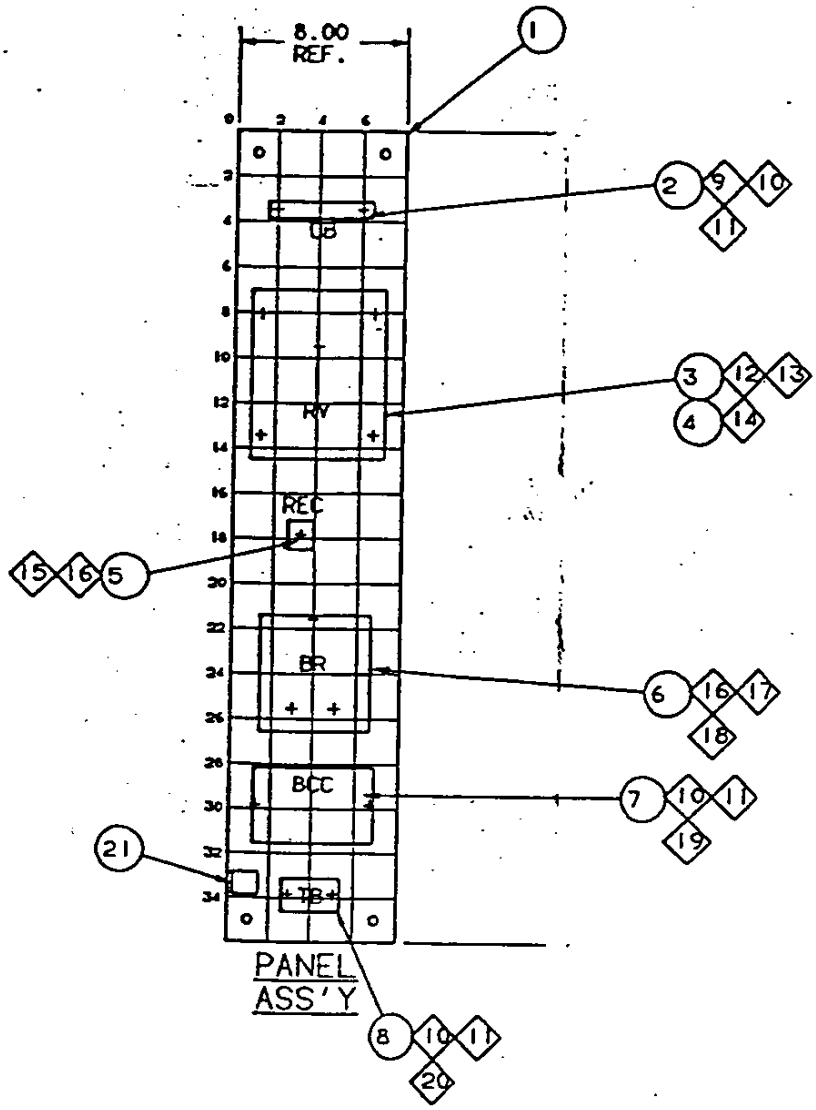
APPLY HEAT CONDUCTIVE GREASE TO BASE OF IT. #6 "RECT" BEFORE MOUNTING TO PANEL PER MANUF. ENG. STD. MPS-284

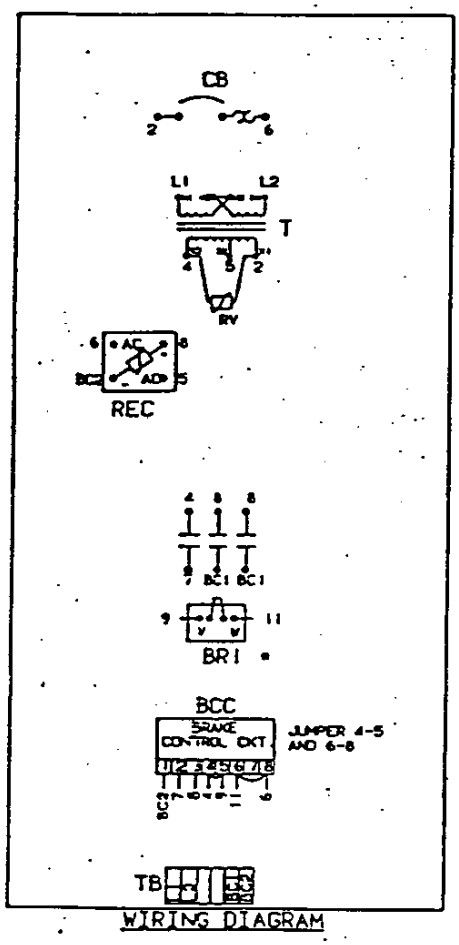
BRAKE RECTIFIER PANEL
979A596-1 TROLLEY

ITEM		DESCRIPTION	PART NO.	QTY
1		PANEL	779E10D5	1
2	*	TRANSFORMER, 0.300 KVA	75Z542D1	1
3		FUSEBLOCK, 30A-250V-1P	79Z2189	1
4	*	FUSE, 3A-250V	79Z95D2	1
5	*	AC CONTACTOR 2POLE, DEF. PURP SEE FE-8-2 FOLLOWING FOR DETAILS.	479U78D1	1
6	*	RECTIFIER	75Z1091	1
7		TERMINAL BOARD - 6	79E4164D6F1	1
8		NOT USED		
9		NOT USED		
10		SCREW, MACH, PAN HD, 10-24 X 1/2 IN	0862V096	4
11		SCREW, MACH, PAN HD, 10-24 X 3/4 IN	0862V099	7
12		LOCKWASHER, NO.10	3616V005	11
13		PLAIN WASHER, NO.10	3631V004	11
14		NOT USED		
15		SCREW, MACH, PAN HD, 8-32 X 1/2 IN	0862V077	2
16		LOCKWASHER, NO.8	3616V004	2
17		PLAIN WASHER, NO.8	3631V003	2

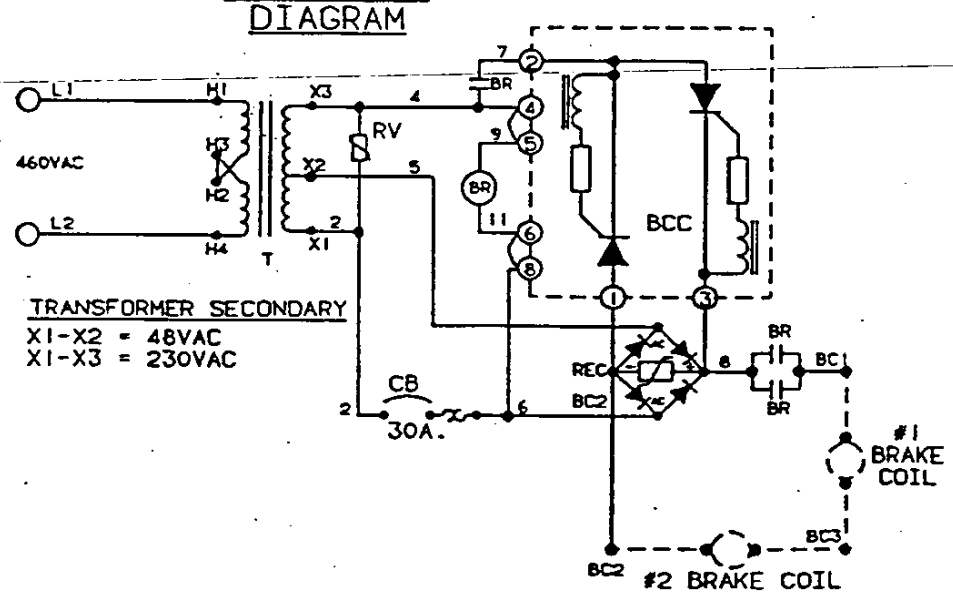
* - RECOMMENDED SPARE

ILLUSTRATION 979A1400F2
BRAKE RECTIFIER PANEL





SCHEMATIC
DIAGRAM



BRAKE RECTIFIER PANEL
979A1400F2

ITEM	DESCRIPTION	PART NO.	QTY
1	PANEL	779E10D8	1
2	CIRCUIT BREAKER, 30A .....(CB)	79Z4145D5	1
3	TRANSFORMER,1.00 KVA .....(T)	75Q119D1	1
4	VARISTOR .....(RV)	80H1050D1	1
5	RECITIFER .....(REC)	75Z1091	1
6	AC CONTACTOR SIZE #1 .....(BR) SEE FE-12-186 FOLLOWING FOR DETAILS.	479U186D11	1
7	BRAKE CONTROL CIRCUIT .....(BCC)	100E4896-2	1
8	TERMINAL BOARD - 6 .....(TB)	79E4164D6F6	1
9	SCREW, MACH, PAN HD, 8-32 X 5/8 IN	0862V079	2
10	LOCKWASHER, NO.8	3616V004	6
11	PLAIN WASHER, NO.8	3631V003	6
12	MACH SCREW, PAN HEAD 1/4-20 X 3/4"	0862V136	4
13	LOCKWASHER 1/4"	3616V007	4
14	PLAIN WASHER, 1/4"	3632V002	4
15	SCREW, MACH, PAN HD, 10-24 X 7/8"	0862V100	1
16	LOCKWASHER, NO.10	3616V005	4
17	PLAIN WASHER, NO.10	3631V004	3
18	SCREW, MACH, PAN HD, 10-24 X 3/4"	0862V099	3
19	SCREW, MACH, PAN HD, 8-32 X 7/8 IN	0862V081	2
20	SCREW, MACH, PAN HD, 8-32 X 1/2 IN	0862V077	2
21	DECAL, "DANGER HIGH VOLTAGE"	32Z1364D2	1

ILLUSTRATION NO. FE-8
CONTACTOR

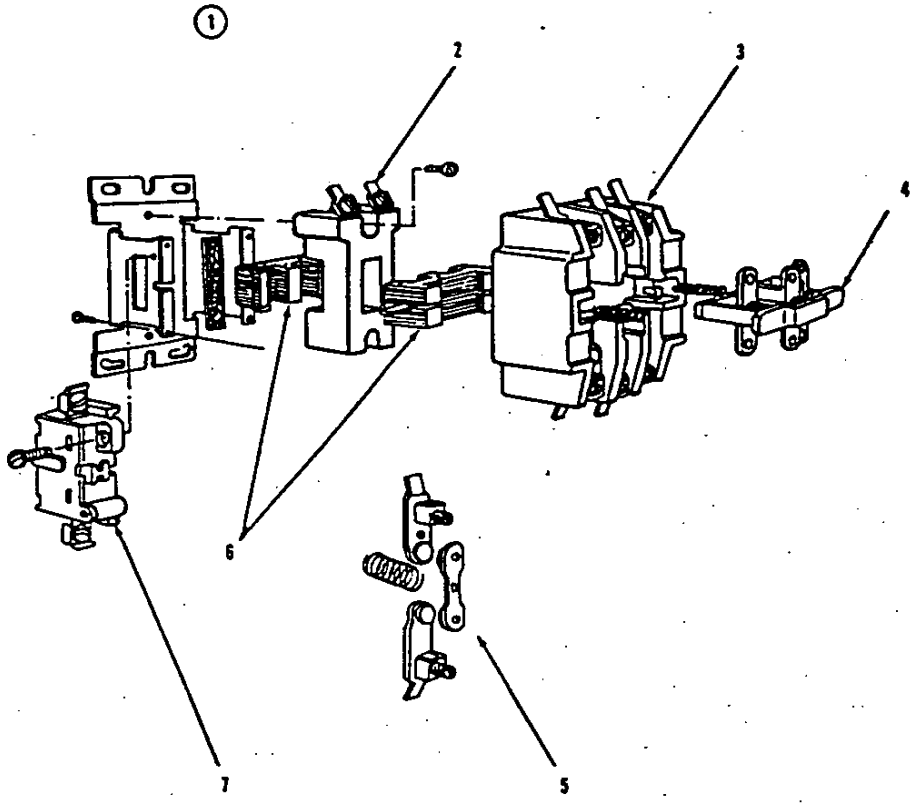


ILLUSTRATION NO. FE-12
CONTACTOR

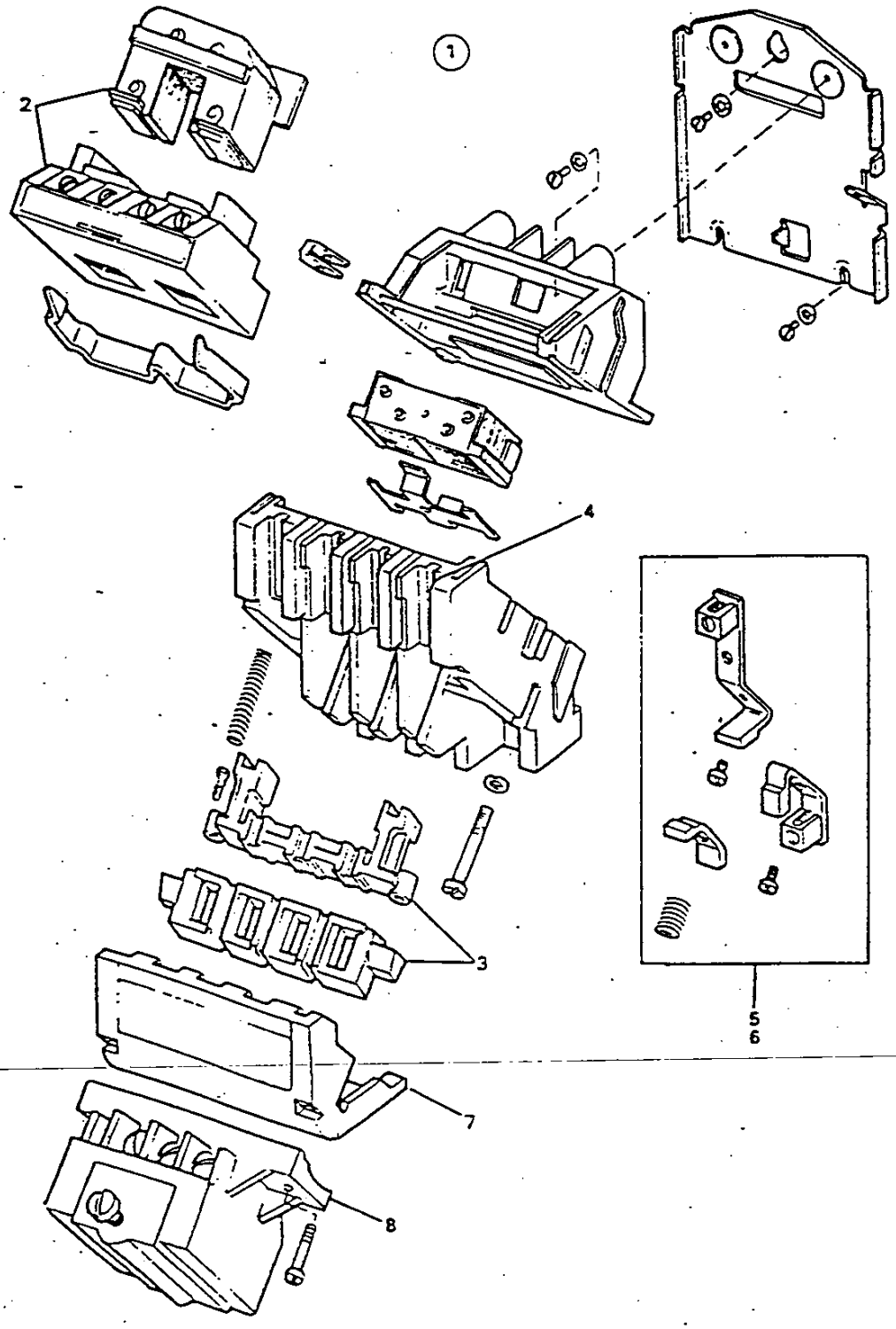


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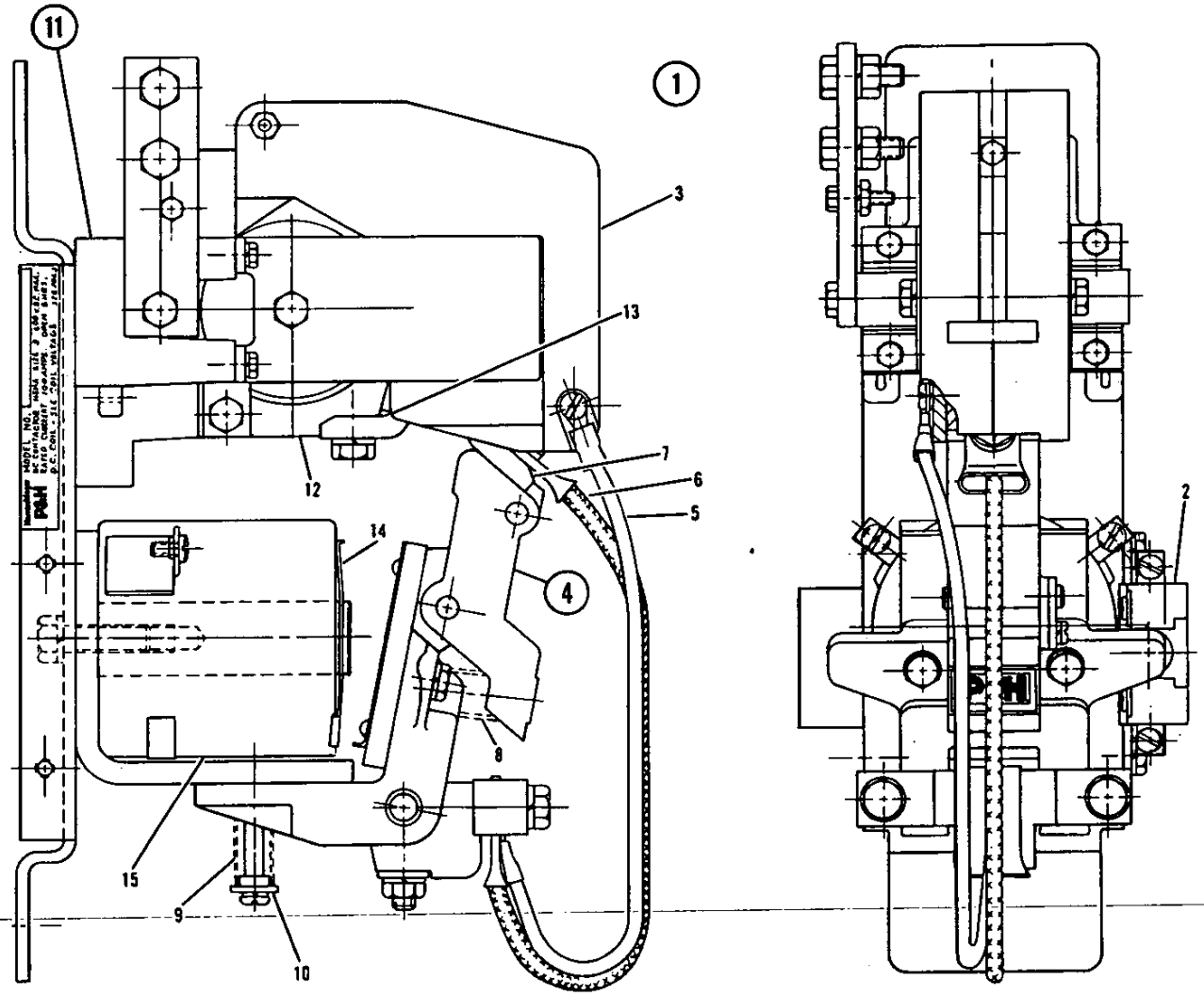
ILLUSTRATION CC-92

SINGLE-POLE UNIVERSAL CONTACTOR



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100A9403

100A8723

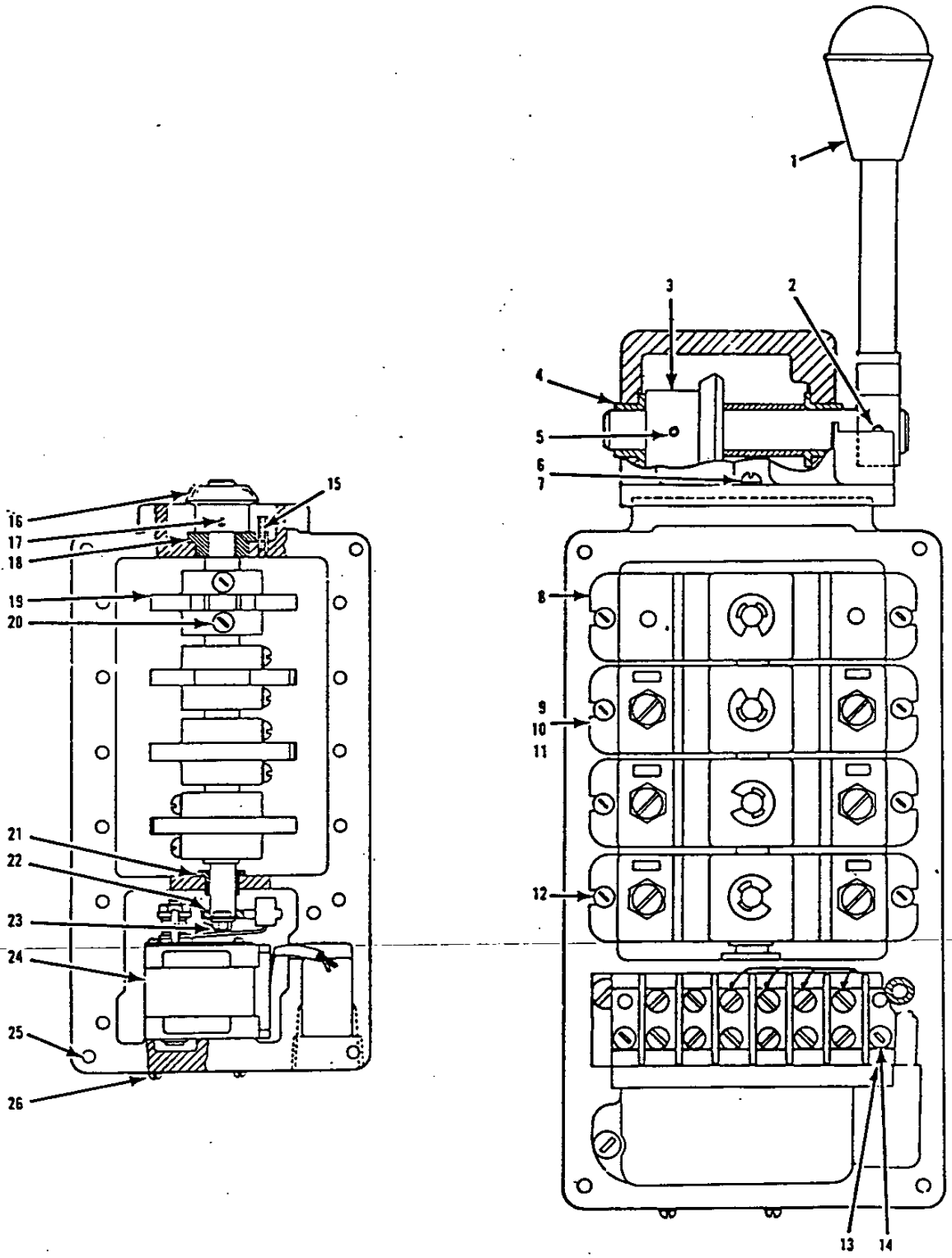
WHEN ORDERING PARTS ALWAYS GIVE MODEL AND MACHINE SERIAL NUMBER

TYPE U-101 CONTACTOR ASSEMBLY
MAIN HOIST

ITEM		DESCRIPTION	PART NO.	QTY
		NOTE: TO ORDER A COMPLETE CONTACTOR ASSY, WHICH INCLUDES THE COILS AND THE ELECTRICAL AND MECHANICAL INTERLOCKS, USE PART NO. U25A200FXX1XX. ITEM 1 DOES NOT INCLUDE COILS.		
1		CONTACTOR ASSEMBLY ..... CONSISTS OF ITEMS 2 THRU 16	100A10879-1	1
2		NOT USED		
3	*	ARC SHIELD	979F789-1	1
4		MOVABLE CONTACT SUBASSEMBLY ..... EACH INCLUDES ITEMS 5 THRU 10	979A175-2	1
5		ARC RUNNER WIRE	79H2260	1
6	*	SHUNT	79F4825	1
7	*	CONTACT TIP	79H2257D2	1
		CAPSCREW, HEX HD, PLT, 1/4-20 X 5/8 IN ...	0826V003	1
		LOCKWASHER, PLT, 1/4 IN	3616V007	1
		PLAIN WASHER, 1/4 IN, BRASS	3608V008	1
8		CONTACT SPRING	17Z845	1
9		RETURN SPRING	17Z844	1
10		RETAINER, RETURN SPRING	18H9080	1
11		STATIONARY CONTACT SUB ASSEMBLY ..... EACH INCLUDES ITEMS 12 AND 13	979A345-2	1
12		BLOWOUT COIL ASSEMBLY	75F245	1
		CAPSCREW, PLT, STEEL 1/4-20 X 3/4 IN	9826V002	1
		LOCKWASHER, PLT, STEEL, 1/4 IN	9616V007	1
		PLAIN WASHER, 1/4 IN, BRASS	3608V008	1
13	*	CONTACT TIP	79H2257D2	1
		CAPSCREW, PLT, STEEL, SPEC., 1/4-20 X 7/16 IN	20H4347-1	1
		LOCKWASHER, PLT, STEEL, 1/4 IN	9616V007	1
14		SPRING WASHER	17F25	1
15	*	COIL	975E640-6	1

* - RECOMMENDED SPARE

ILLUSTRATION NO. GC-69
TYPE SIR MASTER



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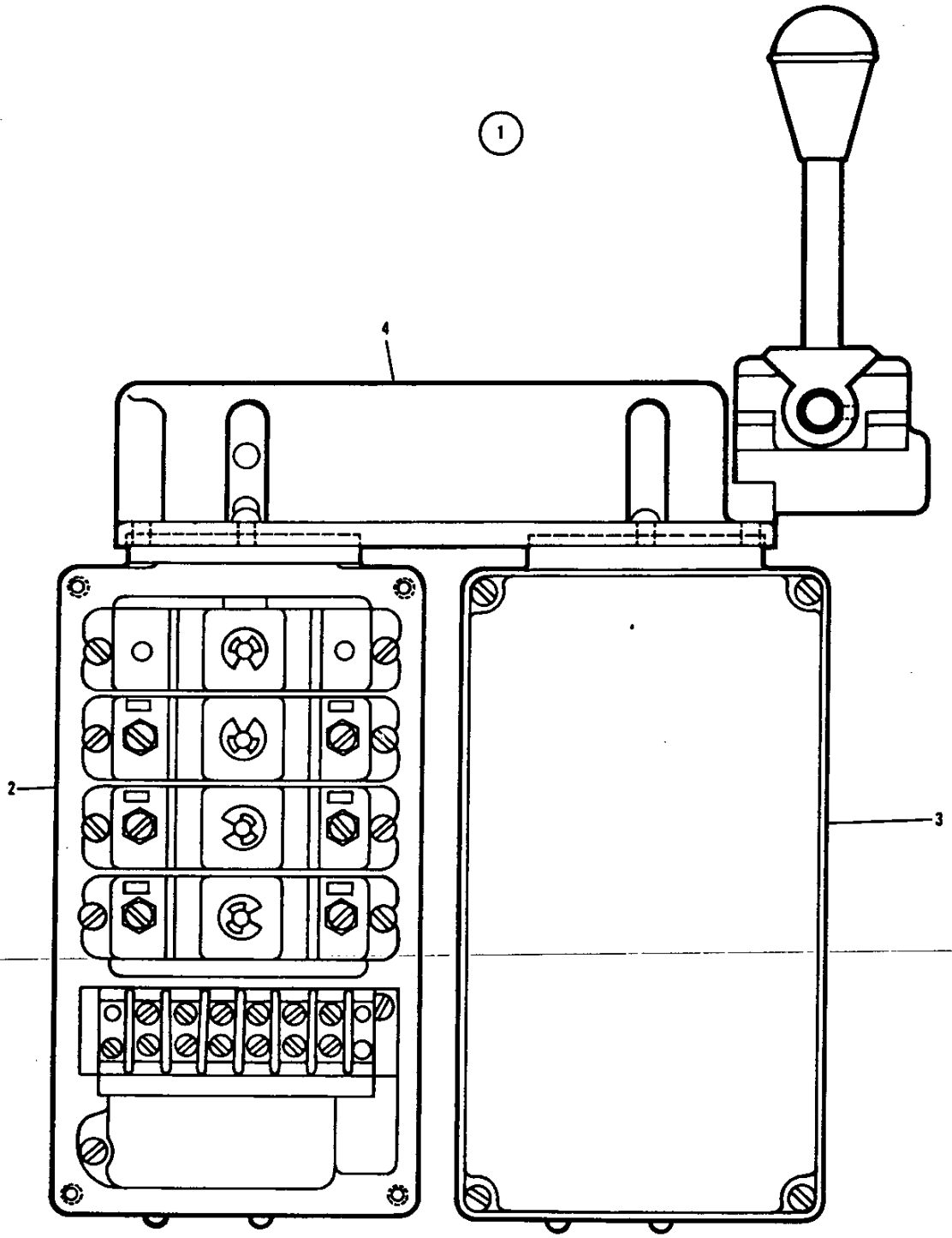
TYPE SIR MASTER
100A3613-2 MAIN HOIST

ITEM		DESCRIPTION	PART NO.	QTY
1		HANDLE ASSEMBLY (INCLUDES KNOB)	6H598	1
	*	KNOB	6Z233	1
2		SETSCREW,HEADLESS SOCKET,HALF DOG POINT, 1/4-28 UNF X 5/8 IN	0885V037	1
3	*	BEVEL GEAR	1H8921	1
4	*	FLANGE BEARING	25H3405D1	2
5		SETSCREW,HEADLESS SOCKET,HALF DOG POINT, 1/4-28 UNF X 1/4 IN	0885V033	1
6		MACH. SCREW, RD HD, 10-24 NC X 5/8 IN	0860V077	2
7		LOCKWASHER, NO.10	3616V005	2
8	*	DETENT ASSEMBLY	100F683-F1	1
9	*	SWITCH ASSEMBLY(INCLUDES ITEMS 10 AND 11)	100F682-F1	3
10		STATIONARY CONTACT	79H1606	2
11		MOVABLE CONTACT	79H1607	1
12		MACH. SCREW, FIL HD, 10-24 NC X 1-1/4 IN	0836V067	8
		LOCKWASHER, NO.10	3616V005	8
13		TERMINAL BLOCK	79Z1077D1	1
14		MACH. SCREW, FIL HD, 6-32 NC X 1/2 IN	0836V029	2
		LOCKWASHER, NO.6	3616V003	2
15		ROLL PIN	19Z8D83	1
16	*	GEAR	1Z120D2	1
17		ROLL PIN	19Z8D58	1
18	*	FLANGE BEARING	25H3405D2	1
19		CAM	18F1190	4
20		MACH. SCREW, FIL HD, 10-24 NC X 3/4 IN	0836V063	8
		LOCKWASHER, NO.10	3616V005	8
21	*	FLANGE BEARING	25Z652D1	1
22		FORK LEVER	6H601D2	1
23		MACH. SCREW, HEX HD, 10-24 X 3/8 IN	0846V080	1
		LOCKWASHER,EXTERNAL-INTERNAL, NO.10	18H4147D4	1
24	*	VARIABLE TRANSFORMER	100F686-F1	1
25		MACH. SCREW, FIL HD, 10-24 X 2-1/4 IN	0836V071	4
		LOCKWASHER, NO.10	3616V005	4
26		MACH. SCREW, RD HD, 4-40 NC X 3/4 IN	0860V010	4
		LOCKWASHER, NO.4	3616V002	4

* - RECOMMENDED SPARE

ILLUSTRATION NO. CC-88

TYPE SJS JOYSTICK OPERATED MASTER SWITCH



Harnischfeger
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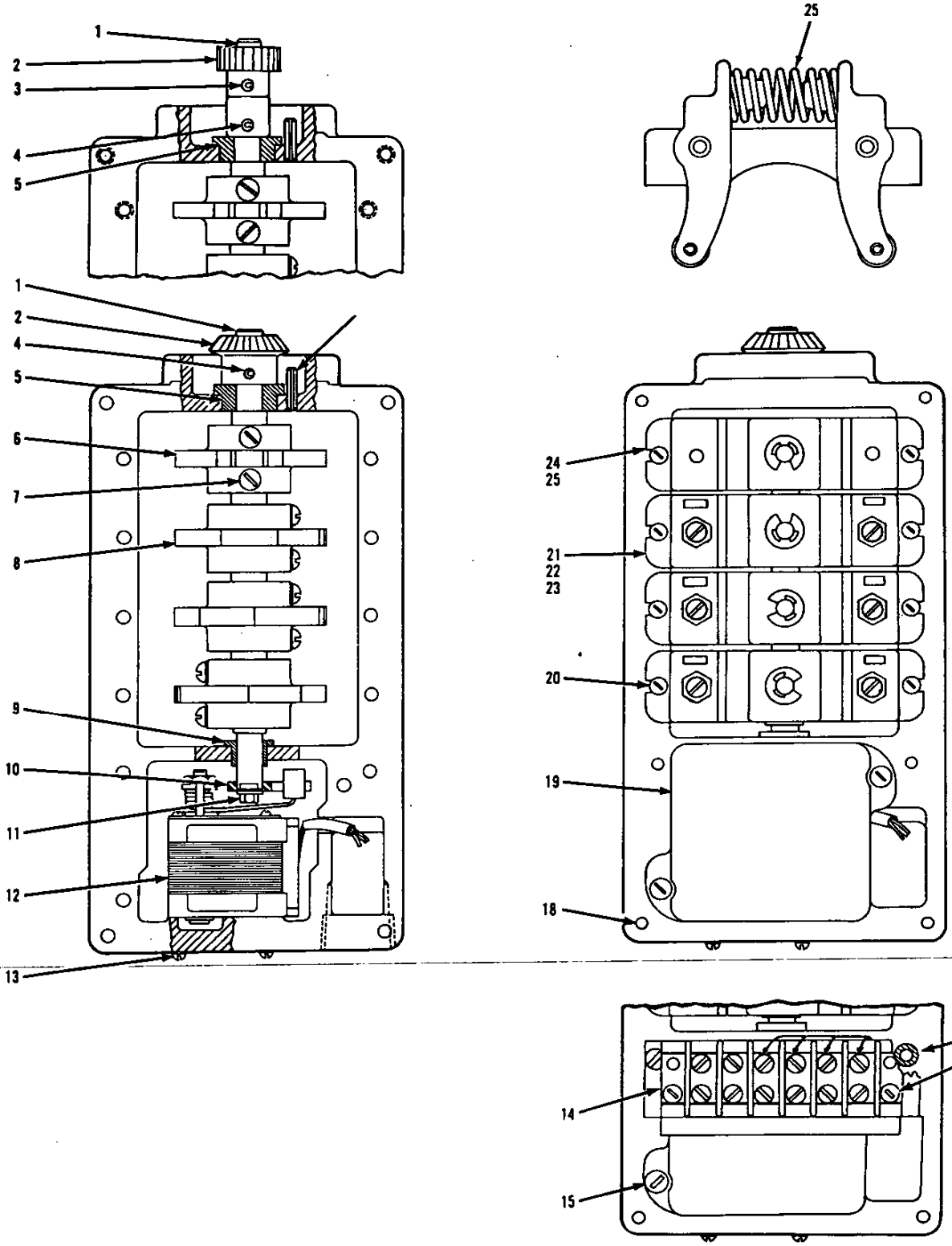
WHEN ORDERING PARTS ALWAYS GIVE MODEL AND MACHINE SERIAL NUMBER

ILLUSTRATION NO. CC-70
JOYSTICK - OPERATED SIR MASTER



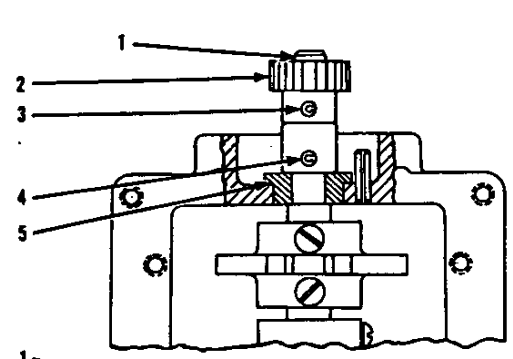
Hamischfeger
P&H

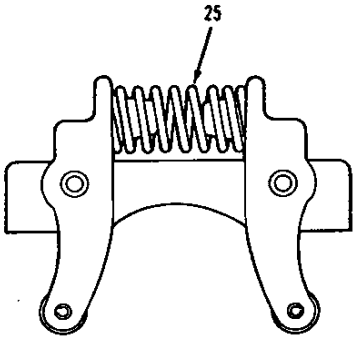
JOYSTICK-OPERATED SIR MASTER W/SPUR GEAR
980A12-7

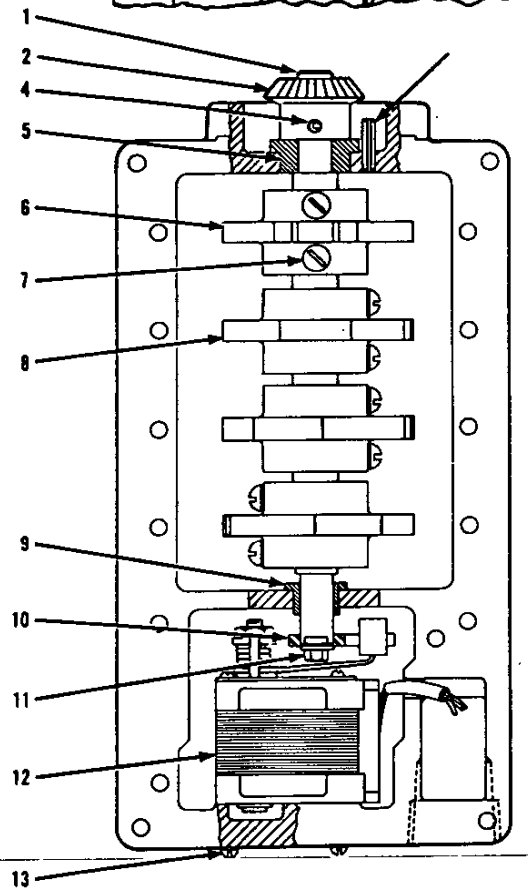
ITEM		DESCRIPTION	PART NO.	QTY
1		SHAFT	10H6207	1
2		GEAR (SPUR)	1Z121D1	1
3		ROLL PIN, 1/8 IN DIA X 3/4 IN LG	19Z8D51	1
4		ROLL PIN, 1/8 IN DIA X 1-3/8 IN LG	19Z8D58	1
5	*	FLANGE BEARING	25H3405D2	1
6		NOT USED		
7		MACH. SCREW, FIL HD, 10-24 X 3/4 IN	0836V063	8
		LOCKWASHER, NO.10	18H4146D7	8
8		CAM	18F1190	4
9	*	FLANGE BEARING	25Z652D2	1
10		FORK LEVER	6H601D1	1
11		MACH. SCREW, HEX HD, 10-24 X 1/4 IN	0846V080	1
		LOCKWASHER, NO.10	18H4147D4	1
12	*	TRANSFORMER, VARIABLE	100F686-1	1
13		MACH. SCREW, RD HD, 4-40 X 3/4 IN	0860V010	4
		LOCKWASHER, NO.4	18H4147D4	4
14		TERMINAL BLOCK	79Z1077D1	1
15		MACH. SCREW, FIL HD, 10-24 X 1/2 IN	0836V060	2
16		MACH. SCREW, FIL HD, 6-32 X 1/2 IN	0836V029	2
		LOCKWASHER, NO.6	3616V003	2
17		SPACER, TERM. BLOCK	18H6690	1
18		MACH. SCREW, FIL HD, 10-24 X 2-1/4 IN	0836V071	4
		LOCKWASHER, NO.10	3616V005	4
19		COVER	14H1456	1
20		MACH. SCREW, FIL HD, 10-24 X 1-1/4 IN	0836V067	3
		LOCKWASHER, NO.10	3616V005	8
21	*	SWITCH ASSEMBLY (INCLUDES ITEMS 22 AND 23).	100F682-2	3
22		STATIONARY CONTACT	79H1606	2
23		MOVABLE CONTACT	79H1607	1
24		DETENT ASSEMBLY	100F683-1	1
25		NOT USED		

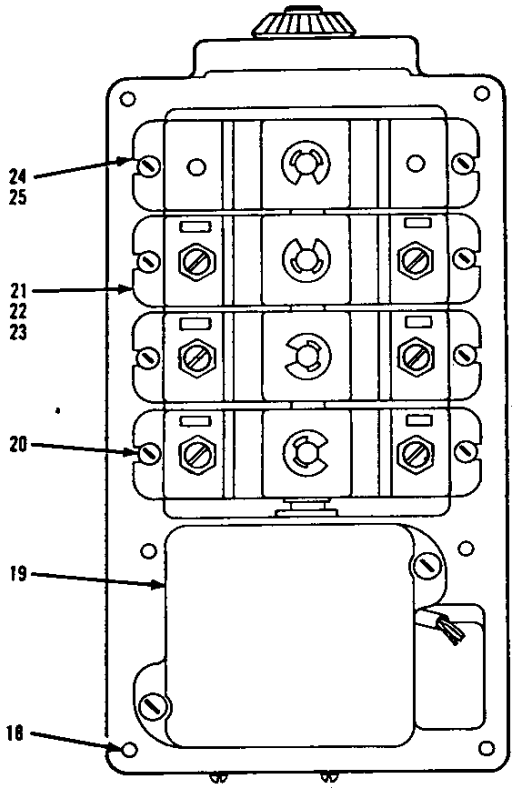
* - RECOMMENDED SPARE

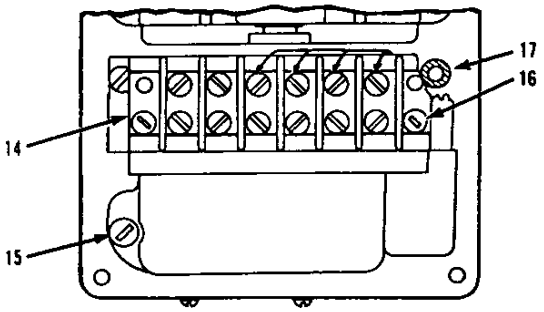
ILLUSTRATION NO. CC-70
JOYSTICK - OPERATED SIR MASTER











Harnischfeger
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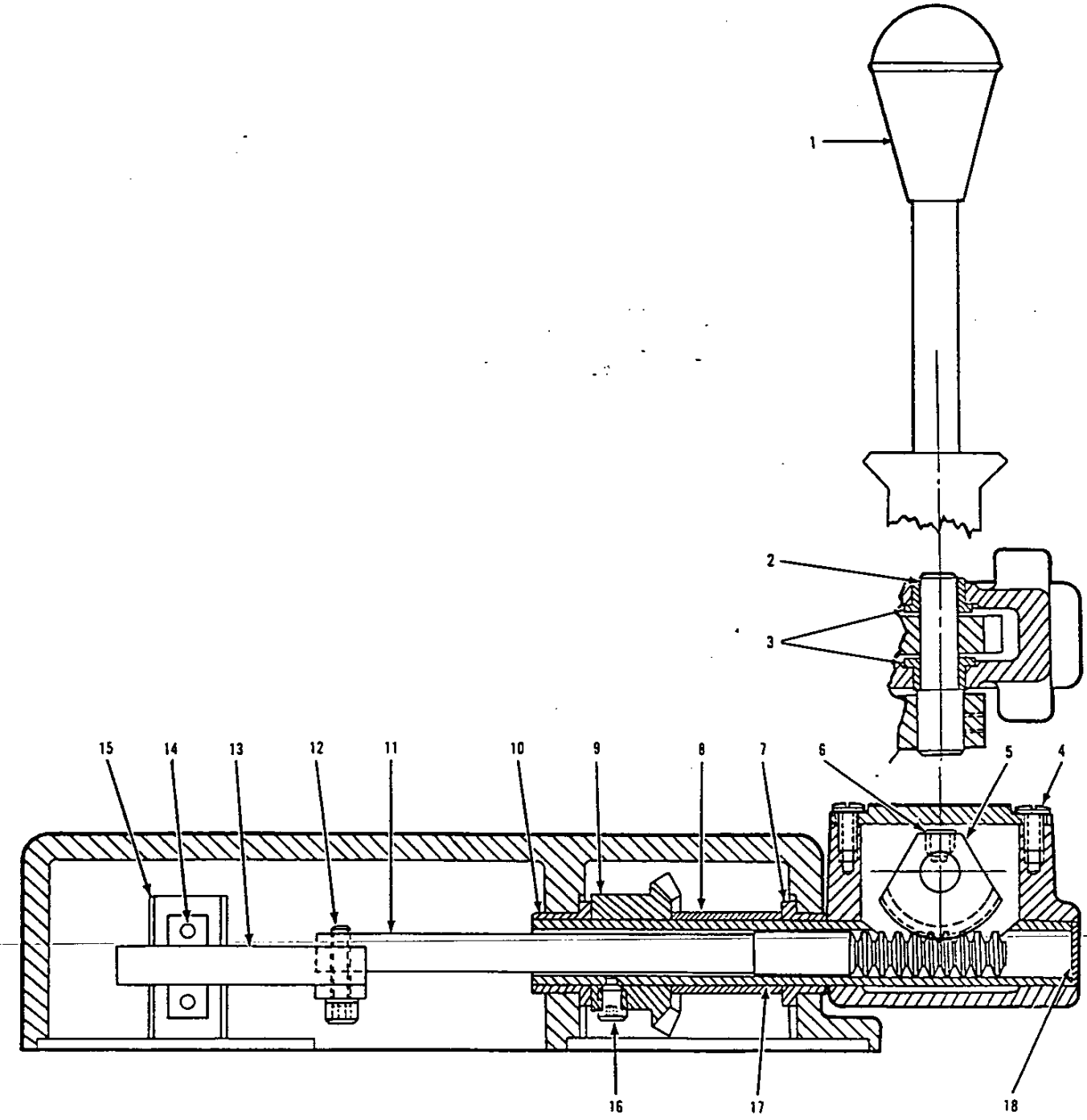
JOYSTICK-OPERATED SIR MASTER W/BEVEL GEAR
980A12-1

ITEM		DESCRIPTION	PART NO.	QTY
1		SHAFT	10H6202	1
2		GEAR (BEVEL)	1Z120D2	1
3		NOT USED		
4		ROLL PIN, 1/8 IN DIA X 1-3/8 IN	19Z8D58	1
5	*	FLANGE BEARING	25H3405D2	1
6		NOT USED		
7		MACH. SCREW, FIL HD, 10-24 X 3/4 IN	0836V063	8
		LOCKWASHER, NO.10	18H4146D7	8
8		CAM	18F1190	4
9	*	FLANGE BEARING	25Z652D1	1
10		FORK LEVER	6H601D1	1
11		MACH. SCREW, HEX HD, 10-24 NC X 1/4 IN	0846V080	1
		LOCKWASHER, NO.10	18H4147D4	1
12	*	TRANSFORMER,VARIABLE	100F686-1	1
13		MACH. SCREW, RD HD, 4-40 NC X 3/4 IN	0860V010	4
		LOCKWASHER, NO.4	3616V002	4
14		TERMINAL BLOCK	79Z1077D1	1
15		MACH. SCREW, FIL HD, 10-24 NC X 1/2 IN	0836V060	2
16		MACH. SCREW, FIL HD, 6-32 NC X 1/2 IN	0836V029	2
		LOCKWASHER, NO.6	3616V003	2
17		SPACER, TERM. BLOCK	18H6690	1
18		MACH. SCREW, FIL HD, 10-24 NC X 2-1/4 IN	0836V071	4
		LOCKWASHER, NO.10	3616V005	4
19		COVER	14H1456	1
20		MACH. SCREW, FIL HD, 10-24 NC X 1-1/4 IN	0836V067	2
		LOCKWASHER, NO.10	3616V005	8
21	*	SWITCH ASSEMBLY (INCLUDES ITEMS 22 AND 23).	100F682-2	3
22		STATIONARY CONTACT	79H1606	2
23		MOVABLE CONTACT	79H1607	1
24	*	DETENT ASSEMBLY	100F683-1	1
25		NOT USED		
26		ROLL PIN, 0.187 DIA X 3/4 IN (NOT SHOWN)	19Z8D83	1

* - RECOMMENDED SPARE

ILLUSTRATION NO. CC-71
JOYSTICK ASSEMBLY



Harnischfeger
P&H

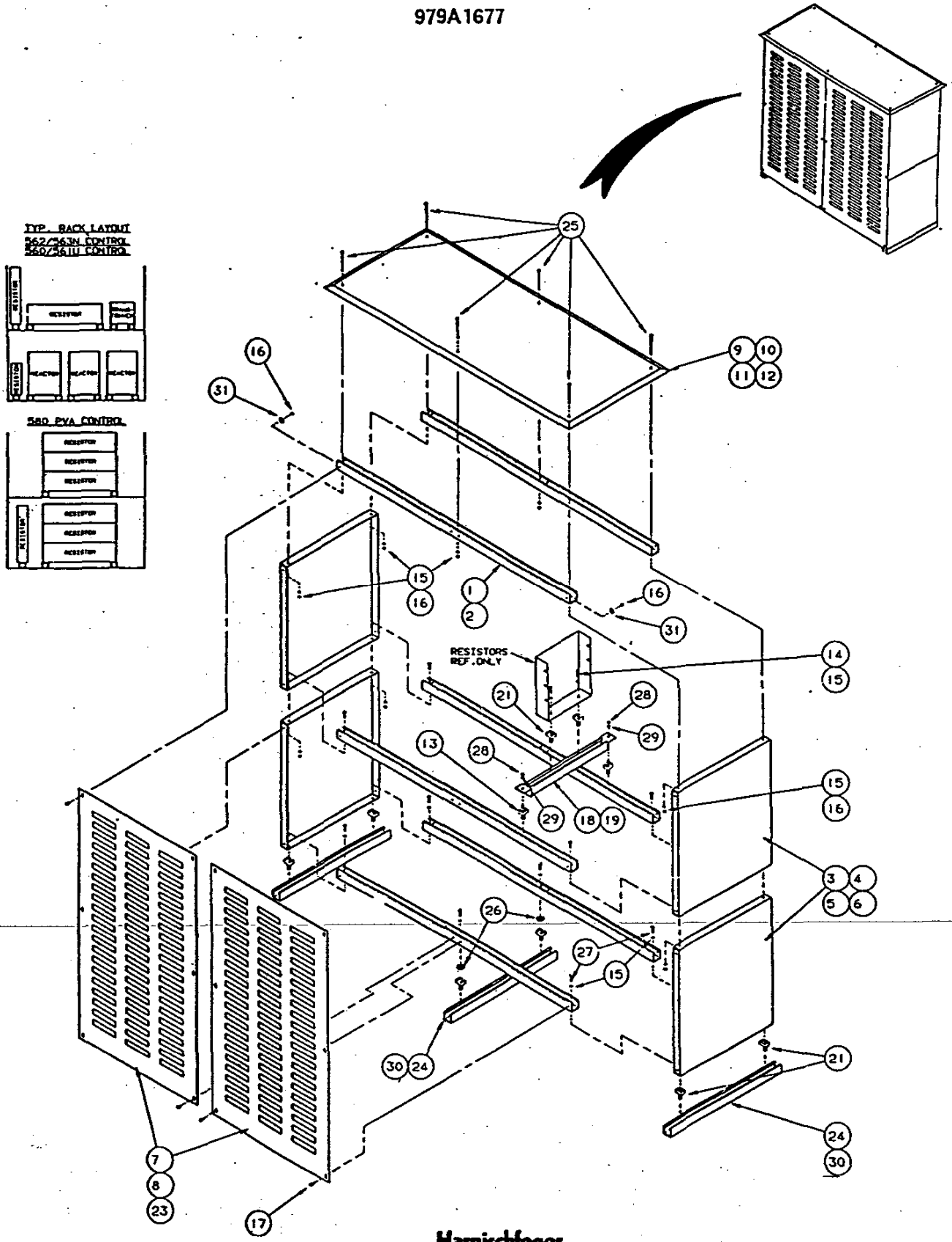
JOYSTICK ASSEMBLY
100E3128-1

ITEM		DESCRIPTION	PART NO.	QTY
1		HANDLE ASSEMBLY (INCLUDES KNOB)	6H598	1
	*	KNOB	6Z233	1
2		PIN,HANDLE SHAFT	10H6211	1
3	*	FLANGE BEARING	25H3405D4	2
4		MACH. SCREW, FIL HD, 6-32 NC X 3/8 IN	0836V027	2
5	*	GEAR,HANDLE	1H8922	1
6		SETSCREW,HEADLESS SOCKET,HALF DOG POINT, 1/4-28 UNF X 1/4 IN	0885V033	1
7	*	FLANGE BEARING	25H3405D5	1
8		NOT USED		
9	*	BEVEL GEAR	1H8923	1
10	*	FLANGE BEARING	25Z652D4	1
11		ROUND RACK	1H8925	1
12		CAPSCREW, SOC HD, 10-32 NF X 3/4 IN	0831V003	1
		LOCKWASHER, NO.10	3616V005	
13		RACK FORK	1H8924	1
14		CAPSCREW, SELF TAP, NO.4 X 5/16 IN	20Z20D4	2
15		GUIDE,RACK FORK	79H1610	1
16		SETSCREW,HEADLESS SOCKET,HALF DOG POINT, 1/4-28 UNF X 5/16 IN	0885V034	1
17		SLEEVE	18H6705	1
18		PLUG	18H6720	1

* - RECOMMENDED SPARE

RESISTOR AND REACTOR RACK ASSEMBLY

979A1677



Harnischfeger

P&H

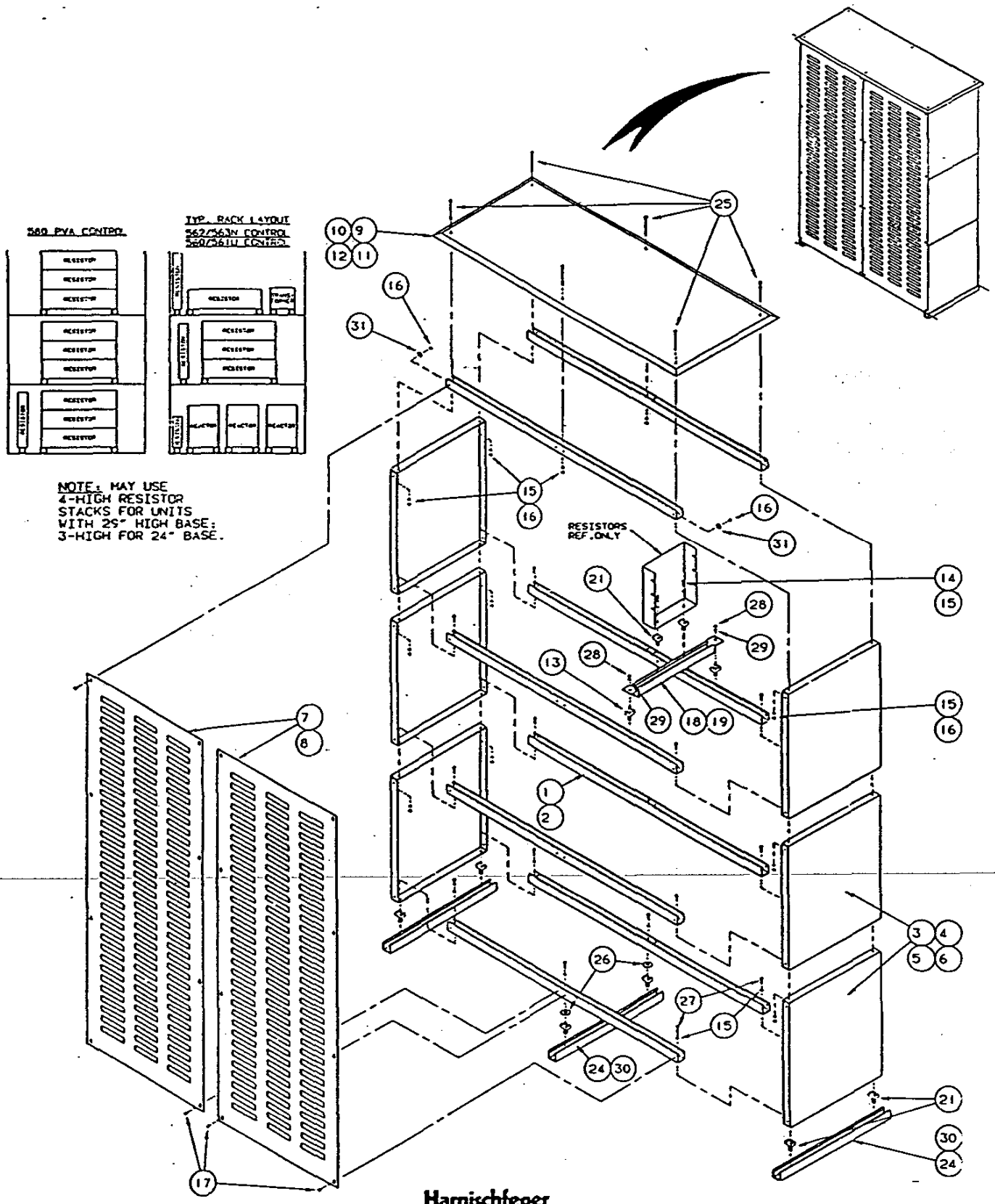
WHEN ORDERING PARTS ALWAYS GIVE MODEL AND MACHINE SERIAL NUMBER

RESISTOR/REACTOR RACK ASSEMBLY
979A1677F5 MAIN HOIST

ITEM	DESCRIPTION	PART NO.	QTY
1	NOT USED		
2	UNISTRUT, 77.79" LG.	20F633D1	6
3	RACK END, 24" X 20"	14E4833D1	2
4	NOT USED		
5	RACK END, 29" X 20"	14E4833D3	2
6	NOT USED		
7	NOT USED		
8	RACK COVER, 53" X 26"	14E4834D2	6
9	NOT USED		
10	NOTUSED		
11	RACK COVER, 80.5" X 22.5"	14E4835D3	1
12	NOT USED		
13	STUD NUT, UNISTRUT, 3/8"-16	20Z1271D1	24
14	MACHSCREW, HEX HEAD 1/4"-20 X 1"	0846V124	26
15	LOCKWASHER, EXTERNAL TOOTH, 1/4"	18H4144D7	54
16	HEX NUT, 1/4"-20	2040V007	54
17	MACHSCREW, HEX HEAD, 1/4"-20 X 1/2"	0826V002	36
18	MOUNTING STRAP	16F8784D1	12
19	NOT USED		
20	NOT USED		
21	UNISTRUT NUT, W/ SPRING	20Z1403D2	32
22	PLAINWASHER	3632V002	10
23	NOT USED		
24	NOT USED		
25	MACHSCREW, HEX HEAD, 1/4"-20 X 2-1/2"	0826V012	6
26	PLAINWASHER	3609V011	2
27	MACHSCREW, HEX HEAD 1/4"-20 X 1-1/4"	0846V126	6
28	HEX NUT, 3/8-16	2145V003	20
29	LOCKWASHER, EXTERNAL TOOTH, 3/8"	18H4144D9	20
30	UNISTRUT, 30" LG.	20F647D20	3
31	PLAINWASHER, 5/16"	3632V003	4

RESISTOR AND REACTOR RACK ASSEMBLY

979A1678



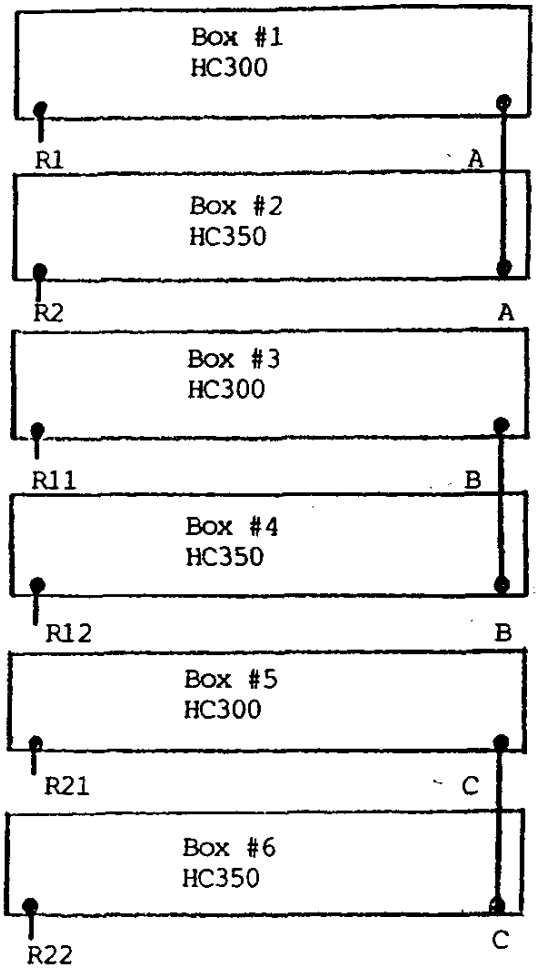
Harnischfeger

P&H

WHEN ORDERING PARTS ALWAYS GIVE MODEL AND MACHINE SERIAL NUMBER

RESISTOR/REACTOR RACK ASSEMBLY
979A1678F4 TROLLEY & BRIDGE

ITEM	DESCRIPTION	PART NO.	QTY
1	NOT USED		
2	UNISTRUT, 77.79" LG.	20F633D2	8
3	RACK END, 24" X 20"	14E4833D1	6
4	NOT USED		
5	NOT USED		
6	NOT USED		
7	RACK COVER, 72" X 26"	14E4834D3	4
8	NOT USED		
9	NOT USED		
10	NOT USED		
11	RACK COVER, 80.5" X 22.5"	14E4835D3	1
12	NOT USED		
13	STUD NUT, UNISTRUT, 3/8"-16	20Z1271D1	32
14	MACHSCREW, HEX HEAD 1/4"-20 X 1"	0846V124	36
15	LOCKWASHER, 1/4"	3615V007	58
16	HEX NUT, 1/4"-20	2040V007	58
17	MACHSCREW, HEX HEAD, 1/4"-20 X 1/2"	0826V002	48
18	MOUNTING STRAP	16F8784D1	16
19	NOT USED		
20	NOT USED		
21	UNISTRUT NUT, W/ SPRING	20Z1403D2	32
22	PLAINWASHER	3632V002	10
23	NOT USED		
24	NOT USED		
25	MACHSCREW, HEX HEAD, 1/4"-20 X 2-1/2"	0826V012	6
26	PLAINWASHER	3609V011	3
27	MACHSCREW, HEX HEAD 1/4"-20 X 1-1/4"	0846V126	6
28	HEX NUT, 3/8-16	2145V003	20
29	LOCKWASHER, EXTERNAL TOOTH, 3/8"	18H4144D9	20
30	UNISTRUT, 30" LG.	20F647D20	3
31	PLAINWASHER, 5/16"	3632V003	4



6 - Group #1 Banks, 25½" long, 12" wide, 6" high.

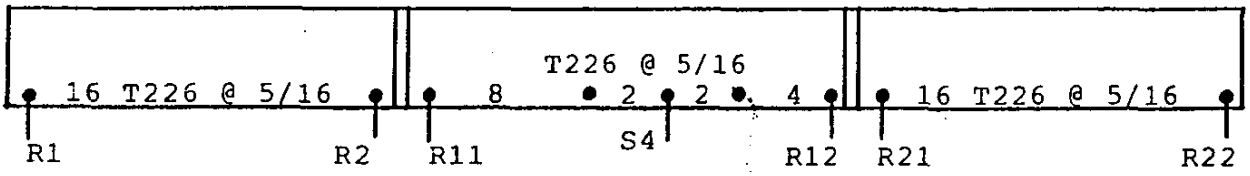
80Q187D15

Main Hoist

STEP	OHMS	C.C.	200 HP A.C.	HP D.C.
R1-R2, R11-R12, R21-R22	,174	300	SEC. VOLTS 364 SEC. AMPS. 250	LINE VOLTS FULL LOAD AMPS
			P&H Control, Elec. 3569	
			NEMA CLASS 1020	

POST GLOVER INC.
P.O. BOX 88, ERLANGER, KENTUCKY 41018
606-341-7657

DRAWN BY	DATE	SCALE	DRAWING NO.
RLA	8/15/86	NONE	32102



1 - Group #2 Bank, 22½" long, 12" wide, 6" high

STEPS	RES.	C.C.
R1-R2, R11-R12, R21-R22	1.648	30
S4-R12	.618	30

10 Hp Wound Rotor Motor

Sec. Volts = 202
Sec. Amps. = 24.7

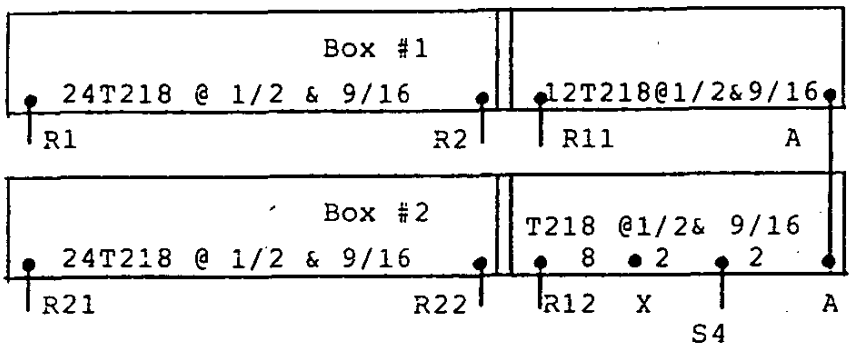
RESISTOR CLASS 1035

P&H Control, Elec. 545
80Q186-D8

TRolley

POST GLOVER INC.
KENTON LANDS ROAD, ERLANGER, KENTUCKY 41018

DWA	11/28/83	NONE	29041
DRAWN BY	DATE	SCALE	DRAWING NO.



2 - Group #1 Banks, each 25½" long, 12" wide, 6" high

STEP	RES.	C.C.
R1-R2, R11-R12, R21-R22	.91	63
S4-R12	.38	63
S4-X	.08	63

30 HP, Wound Rotor Motor

Sec. Volts = 247
Sec. Amps. = 57.5

RESISTOR CLASS 1035

P&H Control, Ekec. 545
80Q186-D12

BRIDGE

POST GLOVER INC.
KENTON LANDS ROAD, ERLANGER, KENTUCKY 41018

DRAWN BY	DATE	SCALE	DRAWING NO.
DA	9/12/83	NONE	29047

ILLUSTRATION NO. CC-80
FORCING RESISTOR ASSEMBLY

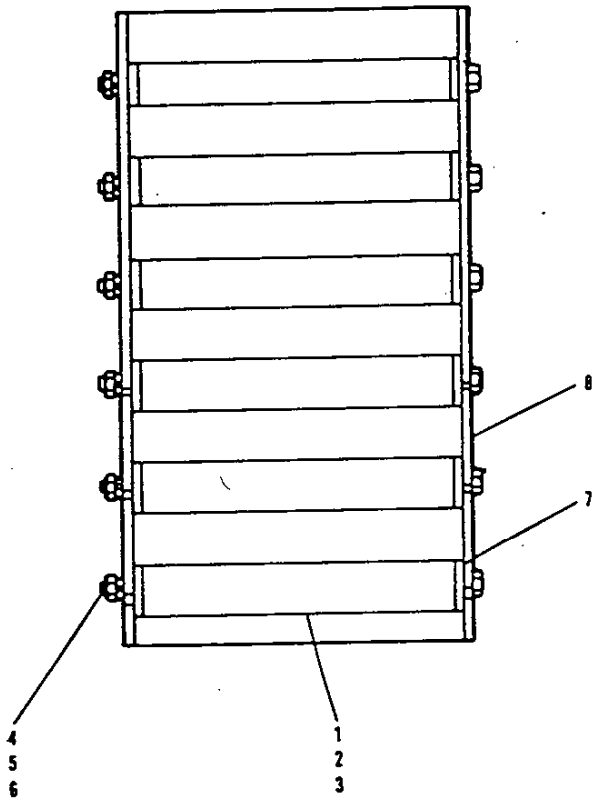
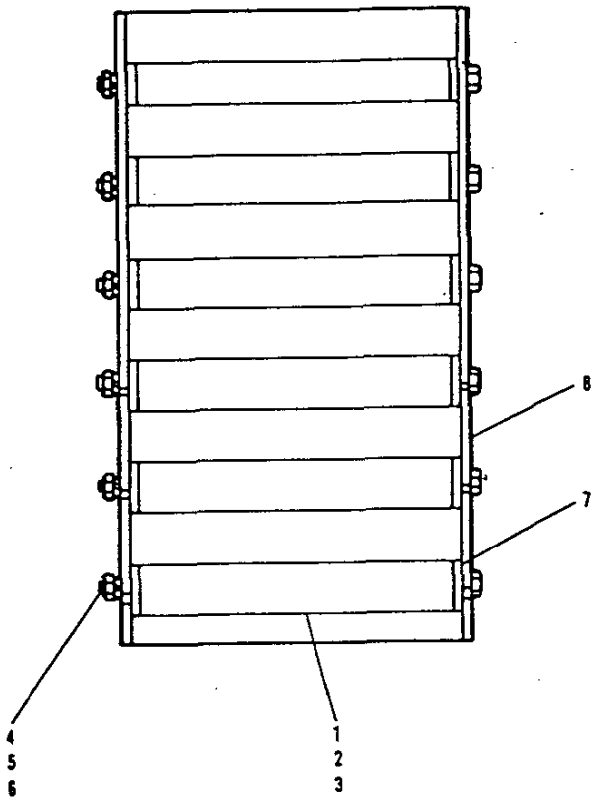
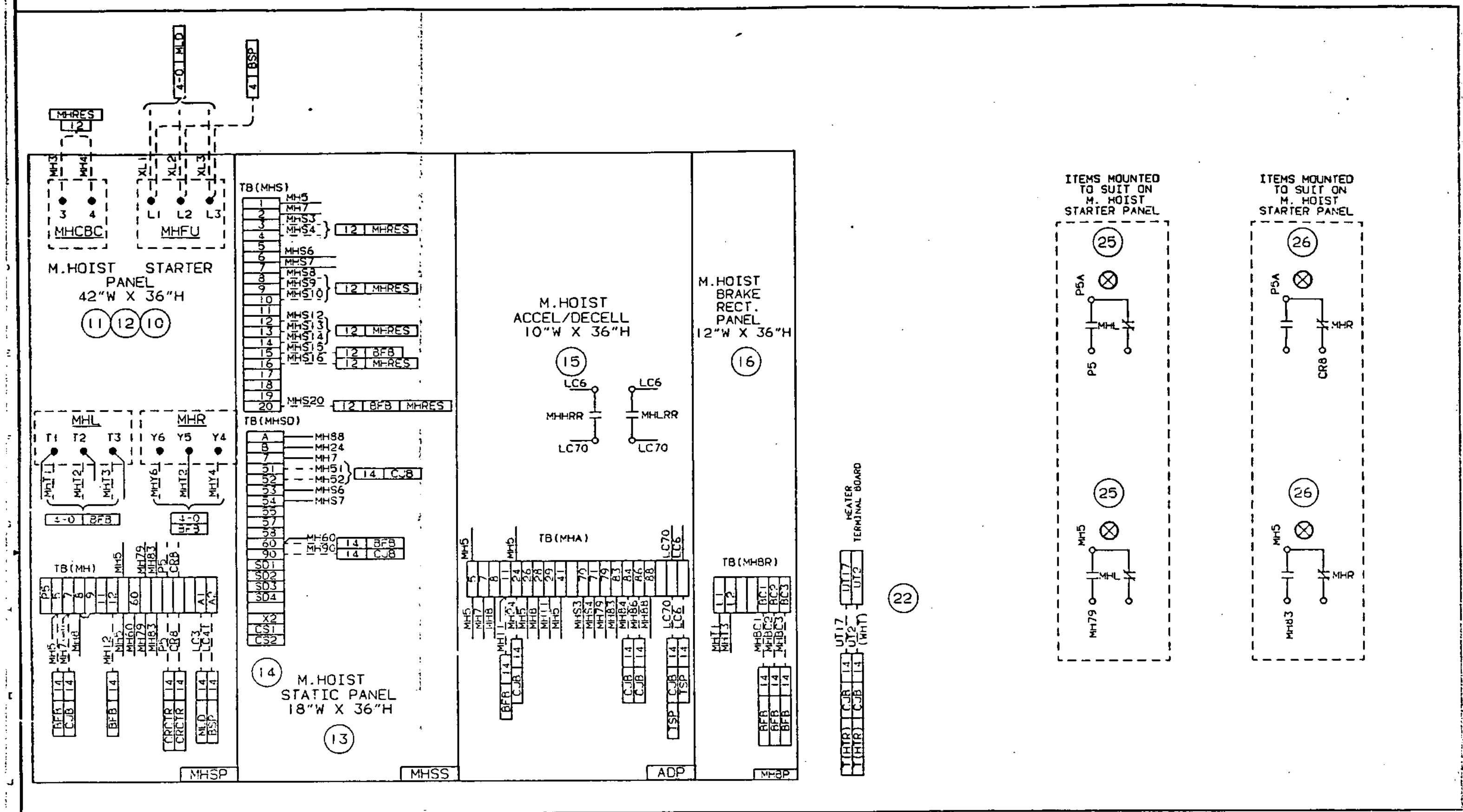


ILLUSTRATION NO. CC-80
FORCING RESISTOR ASSEMBLY



100A14355F1

FRONT VIEW



BILL OF MATERIAL

NO REQ F1	DESCRIPTION	MATERIAL NO P&H		PART NO (PN) SEMI-FNSH(PN)	UNIT WT RGH	UNIT WT FNSH	REF SH	IT NO
1	MH REV PANEL 42W REV45	(A)		979A2393 F1				10
1	PANEL NAMEPLATES (SEE ENGRAVING TABLE BELOW			32H57				11
3	MH OL HEATER			480Z 50 41				12
1	MH STATIC PNL 36 H 18 W	(B)		979A300F23				13
1	MH SLOWDOWN KIT MOUNT ON IT# 12			1079A1F1				14
1	MH ACC-DEC 36 H 10 W	(A)		979A685F1				15
1	MH BRAKE RECT. 12 W	(C)		979A1400-6				16
12	#3/8-16 UNC X 7/8" UNISTRUT STUD NUT			20Z127106				17
12	3/8" HELICAL SPRING LOCKWASHER			3616V009				18
12	3/8 " PLAIN WASHER			3632V004				19
12	#3/8-16 UNC HEX NUT			2145V003				20
2	(SEE NOTE #2) DRIVE PINS			20Z4202				21
1	ENCL HEATER KIT			1079E27F5				22
1	42H 90W 13D ENCLOSURE			14U19006				23
2	(SEE NOTE #1) HIGH VOLTAGE DECAL			32Z158105 •				24
2	CONTACT			47926				25
2	CONTACT			47927				26

(A) See Drawing Following
(B) See Illus. CI-46-23
(C) See Section 4 Preceding

WIRE SIZE & COLOR	WIRE NO.	DEVICE LOCATION
#4-0 BLACK	MHT2	MHR, MHL
#14 BLACK	MHS6	TB(MHSD), TB(MHS)
#14 BLACK	MHS7	TB(MHSD), TB(MHS)
#14 BLACK	MH24	TB(MHSD), TB(MHA)
#14 WHITE	MH7	TB(MHSD), TB(MHA)
#14 BLACK	MH5	TB(MH), TB(MH)
#14 BLACK	MH60	TB(MHSD), TB(MH)
#14 BLACK	MH5	TB(MH), TB(MHS)
#14 WHITE	MH7	TB(MH), TB(MHS)
#14 BLACK	MH8	TB(MH), TB(MHA)
#14 BLACK	MHT1	MHL, TB(MHBR)
#14 BLACK	MHT3	MHL, TB(MHBR)
#14 BLACK	MH83	MHL, TB(MH)

WIRE SIZE & COLOR	WIRE NO.	DEVICE LOCATION
#14 BLACK	MH5	TB(MH), TB(MHA)
#14 BLACK	MH5	TB(MHA), TB(MHA)- TB(MHA), TB(MHA), TB(MHA)
#14 WHITE	MH7	TB(MH), TB(MHA)
#14 BLACK	MH8	TB(MHA), TB(MHA)
#14 BLACK	MH11	TB(MHA), TB(MHA)
#14 BLACK	MHS3	TB(MHA), TB(MHS)
#14 BLACK	MHS4	TB(MHA), TB(MHS)
#14 BLACK	MH79	TB(MHA), TB(MH)
#14 BLACK	MH83	TB(MHA), TB(MH)
#14 BLACK	MH88	TB(MHSD), TB(MHA)
#14 BLACK	P5	MHL, TB(MH)
#14 BLACK	MH5	MHL, MHR, TB(MH)
#14 BLACK	MH79	MHL, TB(MH)
#14 BLACK	P5A	MHL, MHR
#14 BLACK	CR8	MHR, TB(MH)
#14 BLACK	LC6	MHHRR, MHLRR, TB(MHA)
#14 BLACK	LC70	MHHRR, MHLRR, TB(MHA)

NOTES:

ALL #6 AND LARGER WIRE TO BE TYPE XHHW P&H #2027
ALL #8 AND SMALLER WIRE TO BE TYPE THHN/THWN P&H #250

----- WIRES THAT EXIT FROM CONTROL ENCLOSURE ASSEMBLY

⊗ MOUNT AND WIRE AT ASSEMBLY

REFERENCE SCHEMATIC DRAWING 101A14302

NOTES:
1. DECAL PANEL MOUNT-MINIMUM ONE PER CABINET DOOR
2. SECURE PANEL NAMEPLATES TO PANELS WITH DRIVE PINS- DRILL PANEL WITH #37 DRILL TO ACCEPT DRIVE PINS
3. SECURE PANELS TO ENCLOSURE USING HARDWARE IN BILL OF MATERIAL

PANEL- M.HOIST IT # 11

CI29638

F1 ENCLOSURE ASS'Y-

	Change			
(B)	LC6 WIRE WAS LC7	RFK	EVW	DND 1-88
(A)	IT. 22 WAS F4. IT. 23 WAS D5. ADDED WIRING.	OJR	EVW	DND 1-88

CAD/CAM DRAWING - DO NOT MANUALLY CHANGE

DECIMAL INCH

ENCLOSURE ASS'Y
E.O.T.C.
P&H
12-87

100A14355F1 F1

100A14355F2 SH 1 OF 2

FRONT VIEW

SEE SHEET #2

BILL OF MATERIAL

NO REQ F2	DESCRIPTION	MATERIAL NO P&H		PART NO (PN) SEMI-FNSH (PN)	UNIT WT RGH	FNSH	REF SH	IT NO
3	T POWER FUSES 20AMP			79Z754D 11				10
1	T REV PANEL 12W REV 1	(A)		979A1817F 1				11
1	PANEL NAMEPLATES (SEE ENGRAVING TABLE BELOW			32H57				12
3	T OL HEATER			480Z 50 57				13
1	T STATIC PNL 36 H 9 W	(B)		979A299F3				14
1	T SLOWDOWN 36 H 6 W	(A)		979A320F5				15
1	T BRAKE RECT. 5 W	(C)		979A596-1				16
3	B POWER FUSES 125AMP			79Z754D 24				17
1	B REV PANEL 15W REV 3	(A)		979A1831F 2				18
1	PANEL NAMEPLATES (SEE ENGRAVING TABLE BELOW			32H57				19
6	B OL HEATER			480Z 50 73				20
1	B STATIC PNL 36 H 9 W	(B)		979A299F3				21
1	B SLOWDOWN 36 H 6 W	(A)		979A320F5				22
1	B BRAKE RECT. 8 W	(C)		979A1400-2				23
24	#3/8-16 UNC X 7/8" UNISTRUT STUD NUT			20Z127I06				24
24	3/8" HELICAL SPRING LOCKWASHER			3616V009				25
24	3/8 " PLAIN WASHER			3632V004				26
24	#3/8-16 UNC HEX NUT			2145V003				27
3	(SEE NOTE #2) DRIVE PINS			20Z4202				28
1	ENCL HEATER KIT			1079E27F5				29
1	42H 80W 130 ENCLOSURE			14U1900 5				30
2	(SEE NOTE #1) HIGH VOLTAGE DECAL			32Z1581D5				31
4	N.C.CONTACTS			479U16502				32
2	N.O.CONTACTS			479U16501				33

(A) See Drawing Following
(B) See Illus. CI-45-1
(C) See Section 4 Preceding

(30)

PANEL- BRIDGE IT # 19

PANEL- TROLLEY IT # 12

REFERENCE SCHEMATIC DRAWING 101A14302

NOTES:
ALL #6 AND LARGER WIRE TO BE TYPE XHHW P&H #2027
ALL #8 AND SMALLER WIRE TO BE TYPE THHN/THWN P&H #250

----- WIRES THAT EXIT FROM CONTROL ENCLOSURE ASSEMBLY

⊗ MOUNT AND WIRE AT ASSEMBLY

NOTES:
1. DECAL PANEL MOUNT-MINIMUM ONE PER CABINET DOOR
2. SECURE PANEL NAMEPLATES TO PANELS WITH DRIVE PINS-DRILL PANEL WITH #37 DRILL TO ACCEPT DRIVE PINS
3. SECURE PANELS TO ENCLOSURE USING HARDWARE IN BILL OF MATERIAL

CI29638

F2 ENCLOSURE ASS'Y-

	CHANGE	CHKD BY	APPD BY	DATE
C	SEE SHEET #2	RFK	EVW	DND 1-88
A	ADDED SHEET #2 WIRING	RFK	EVW	DND 1-88

CAD/CAM DRAWING - DO NOT MANUALLY CHANGE

SCALE NONE — RELEASE DATE 12-87 — DR SL — JCH

TITLE: ENCLOSURE ASS'Y E.O.T.C.

100A14355F2 SH 1 OF 2

P&H Harnischfeger

ALL DIMENSIONS ARE IN DECIMAL INCH (UNLESS OTHERWISE NOTED)

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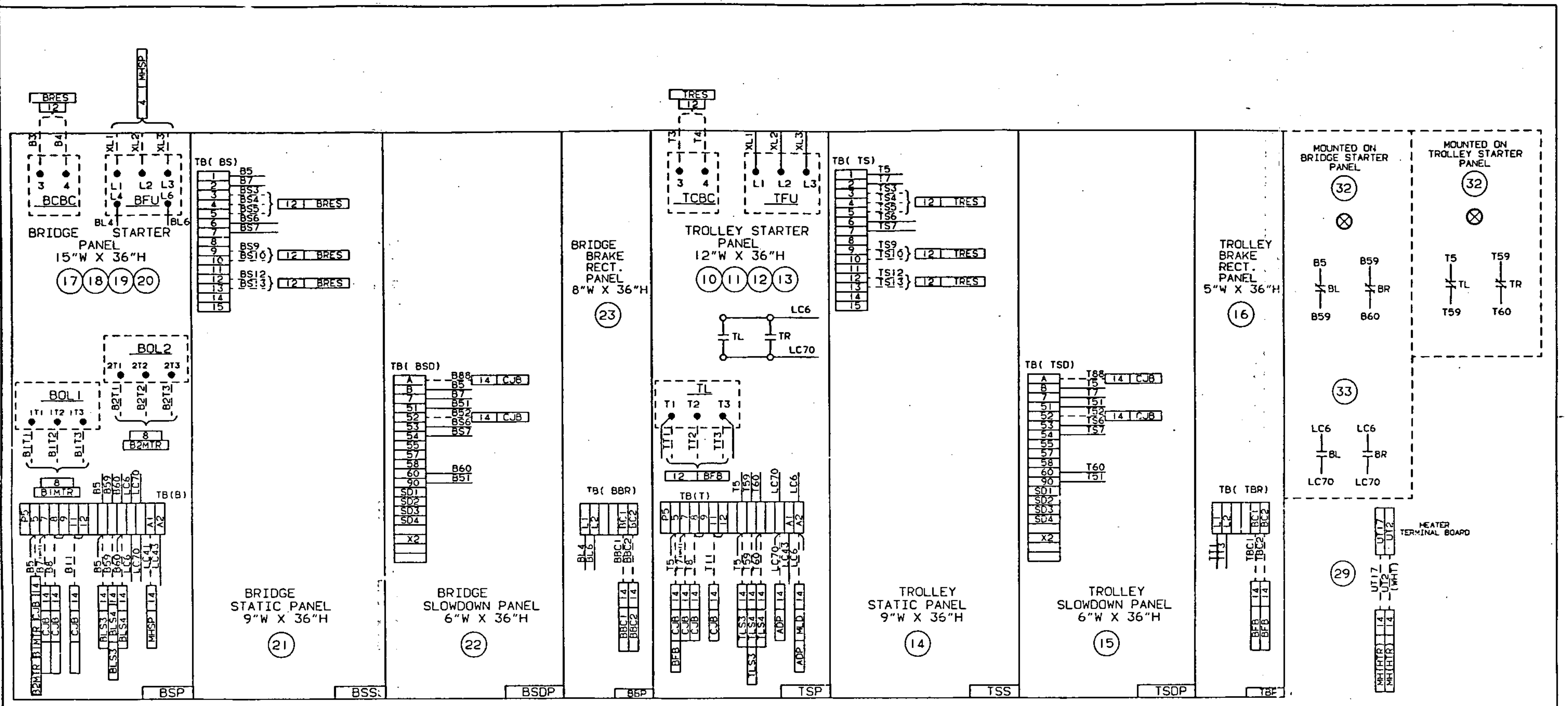
100A14355F2 #2 of 2

FRONT VIEW



WIRE SIZE & COLOR	WIRE NO.	DEVICE LOCATION
#14 BLACK	B5	TB(B),TB(BS)
#14 WHITE	B7	TB(B),TB(BS)
#14 BLACK	BS6	TB(BSD),TB(BS)
#14 BLACK	BS7	TB(BSD),TB(BS)
#14 WHITE	B7	TB(BSD),TB(B)
#14 BLACK	B5	TB(BSD),TB(B)
#14 BLACK	B51	TB(BSD),TB(BSD)
#14 BLACK	B5	TB(B),TB(B)
#14 BLACK	B5	BL,TB(B)
#14 BLACK	B59	BL, BR,TB(B)
#14 BLACK	B60	BR,TB(B)-TB(B),TB(BSD)
#14 BLACK	BL6	BFU,TB(BBR)
#14 BLACK	BL4	BFU,TB(BBR)
#12 BLACK	XL1	TFU, BFU
#12 BLACK	XL2	TFU, BFU
#12 BLACK	XL3	TFU, BFU
#14 BLACK	T5	TB(T),TB(TS)
#14 WHITE	T7	TB(T),TB(TS)
#14 BLACK	TS6	TB(TSD),TB(TS)
#14 BLACK	TS7	TB(TSD),TB(TS)
#14 WHITE	T7	TB(TSD),TB(T)
#14 BLACK	T5	TB(TSD),TB(T)
#14 BLACK	T51	TB(TSD),TB(TSD)
#14 BLACK	T5	TB(T),TB(T)
#14 BLACK	T5	TL,TB(T)
#14 BLACK	T59	TL, TR,TB(T)
#14 BLACK	T60	TR,TB(T)-TB(T),TB(TSD)

WIRE SIZE & COLOR	WIRE NO.	DEVICE LOCATION
#14 BLACK	TT1	TL,TB(TBR)
#14 BLACK	TT3	TL,TB(TBR)
#14 BLACK	LC43	TB(T),TB(B)
#14 BLACK	LC6	TR,TB(T)
#14 BLACK	LC70	TR,TB(T)
#14 BLACK	LC6	TB(T),TB(B)
#14 BLACK	LC70	TB(T),TB(B)
#14 BLACK	LC6	BL,BR,TB(B)
#14 BLACK	LC70	BL,BR,TB(B)

NOTES:

ALL #6 AND LARGER WIRE TO BE TYPE XHHW P&H #2027 (30)

ALL #8 AND SMALLER WIRE TO BE TYPE THHN/THWN P&H #250

----- WIRES THAT EXIT FROM CONTROL ENCLOSURE ASSEMBLY

⊗ MOUNT AND WIRE AT ASSEMBLY

REFERENCE SCHEMATIC DRAWING 101A14302

NOTES:

1. DECAL PANEL MOUNT-MINIMUM ONE PER CABINET DOOR

2. SECURE PANEL NAMEPLATES TO PANELS WITH DRIVE PINS-DRILL PANEL WITH #37 DRILL TO ACCEPT DRIVE PINS

3. SECURE PANELS TO ENCLOSURE USING HARDWARE IN BILL OF MATERIAL

CI29638

C	LC6 WIRE WAS LC7	RFK	EVW	DND 1-88
A	SEE SHEET #1	RFK	EVW	DND 1-88
	CHANGE			

CAD/CAM DRAWING - DO NOT MANUALLY CHANGE

F2 ENCLOSURE ASS'Y-

SCALE NONE · RELEASE DATE 1-88 · DRAWN RFK · CHECKED EVW · APPROVED DND

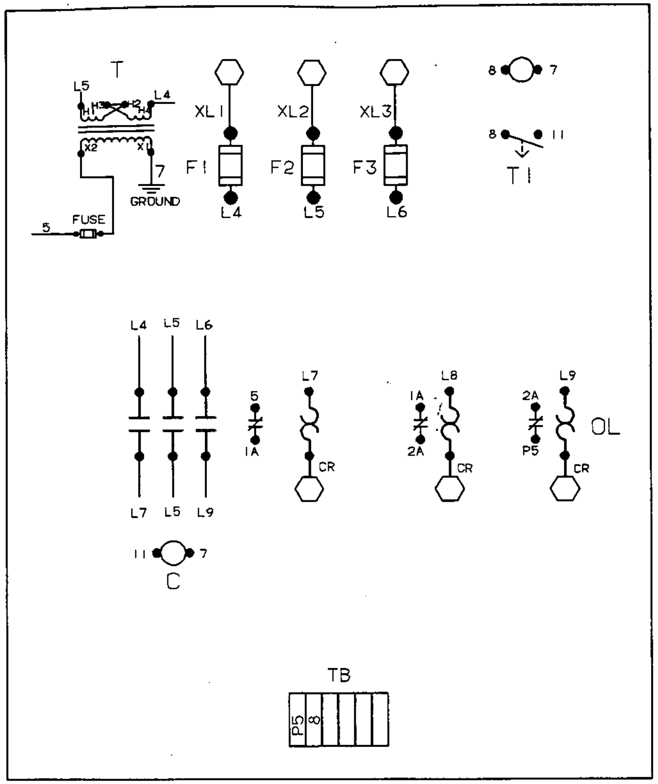
ENCLOSURE ASS'Y E.O.T.C.

P&H Harnischfeger

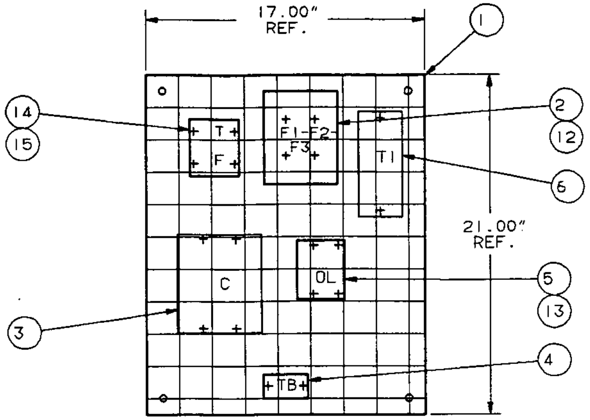
100A14355F2 #2 of 2

ALL DIMENSIONS ARE IN DECIMAL INCH

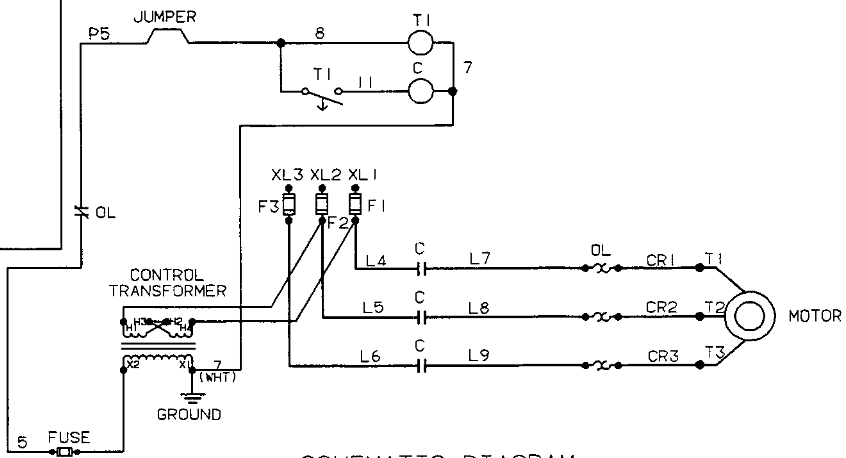
2234IM 6-82
DWG NO 979A2392F1



WIRING DIAGRAM



SUBPANEL



SCHEMATIC DIAGRAM

NOTE:

⬡ = EXTERNAL CONNECTION

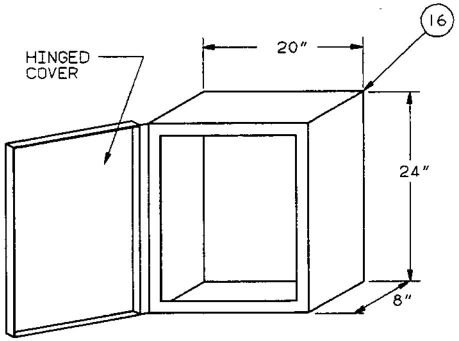
ALL #6 AND LARGER WIRE TO BE TYPE XHHW P&H #2027
ALL #8 AND SMALLER WIRE TO BE TYPE THHN/THWN P&H #250

WIRE COLOR & SIZE	WIRE NO	DEVICE LOCATION
#12 BLACK	L4	F1,C
#12 BLACK	L5	F2,C
#12 BLACK	L6	F3,C
#14 WHITE	7	C,T1,T
#14 BLACK	8	T1,TB
#14 BLACK	5	T,OL
#14 BLACK	1A	OL,OL
#14 BLACK	2A	OL,OL
#14 BLACK	P5	OL,T
#14 BLACK	11	C,T1
#14 BLACK	L4	F1,T
#14 BLACK	L5	F2,T
#12 BLACK	L7	C,OL
#12 BLACK	L8	C,OL
#12 BLACK	L9	C,OL

BILL OF MATERIAL

NO REQ F1	DESCRIPTION	MATERIAL NO P&H	PART NO (PN) SEMI-FNSH(PN)	DEVICE DESIGNATION	IT NO
1	PANEL 17" X 21"		79Z3761D5		1
1	FUSEBLOCK 30A-600V-3P		79Z1381D5		2
1	AC CONTACTOR SIZE #1		479U186D11	C	3
1	TERMINAL BOARD-6		79E4164D6F6	TB	4
1	O.L. RELAY		479040D5	OL	5
1	TIMER OFF DELAY		79Z1067D1	T1	6
					7
					8
					9
					10
					11
3	FUSE		79Z754D7	F1-F2-F3	12
3	HEATER ELEMENTS		480Z5D39		13
1	TRANSFORMER		75Z1122D1	T	14
1	FUSE		79Z95D1	F	15
1	ENCLOSURE		14Q83D22		16

Ⓐ SEE ILLUS. FE-12-186



ENCLOSURE
(ORDER SEPERATELY)
NEMA 3R--14Q134D14
NEMA 12--14Q83D22
NEMA 4--14Q141D6
NEMA 4X--14Q213D11

ALL DIMENSIONS ARE IN DECIMAL INCH (UNLESS OTHERWISE NOTED)

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	CHANGE	DWG BY	CHKD BY	INITIALS & DATE
Ⓐ	ADDED ITEM #16	S.L.	CAR	DND 3-88

CAD/CAM DRAWING - DO NOT MANUALLY CHANGE

F1

SIZE #1 STARTER FOR CABLE REEL CONTROL

DWN RFK
CHKD JCH
APPD DND
RELEASE DATE 12-87
SCALE 1:4

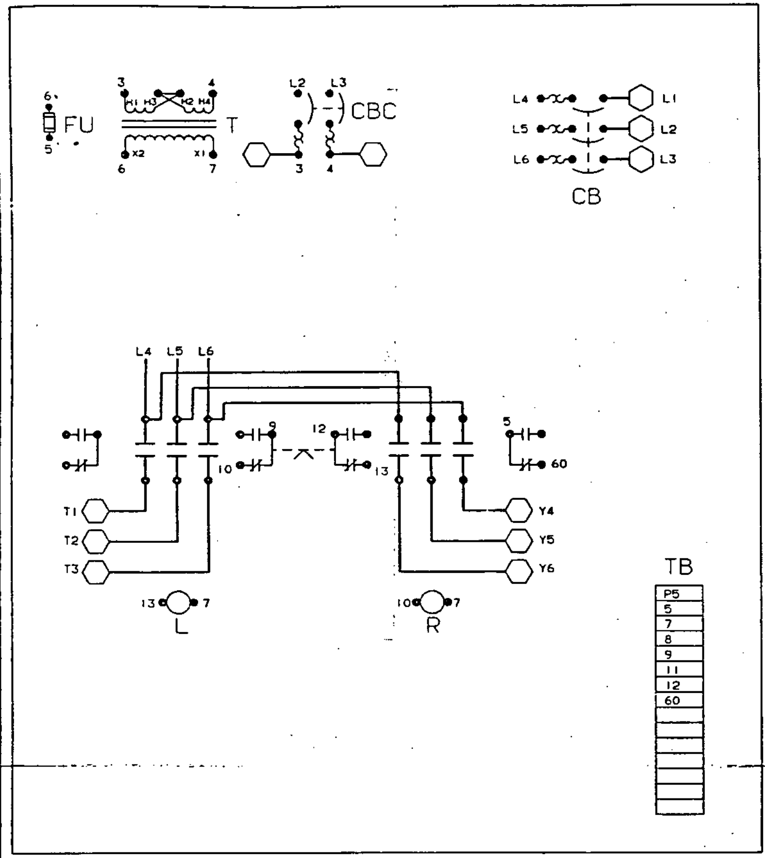
STARTER ASSEMBLY
E.O.T.C.

979A2392F1

SH 1 OF 1

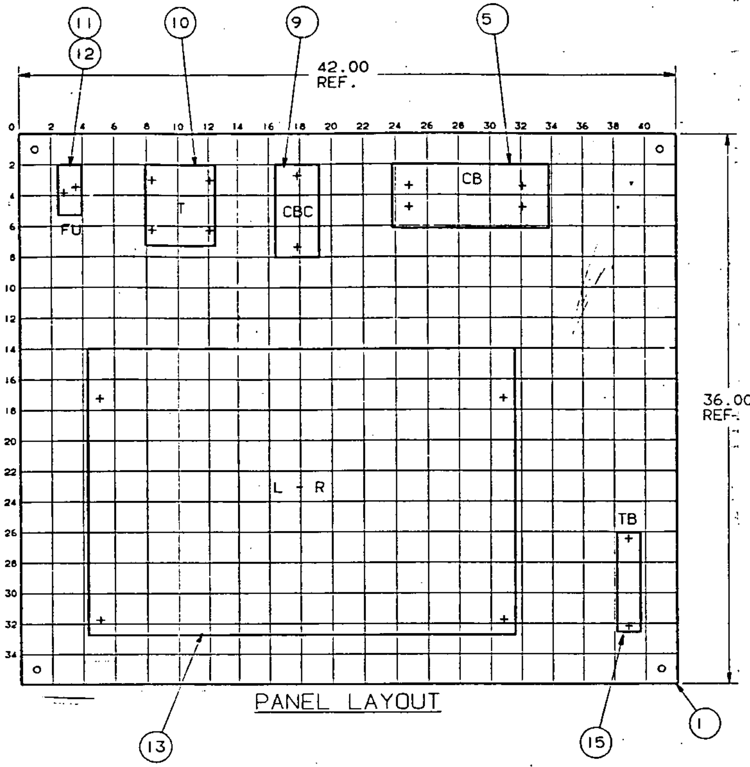
2234IM 6-82

979A2393F1



WIRING DIAGRAM

WIRE COLOR & SIZE	WIRE NO.	DEVICE LOCATION
#4/0 BLACK	L4	CB,L
#4/0 BLACK	L5	CB,L
#4/0 BLACK	L6	CB,L
#14 BLACK	L2	CBC,CB
#14 BLACK	L3	CBC,CB
#14 BLACK	3	CBC,T
#14 BLACK	4	CBC,T
#14 RED	5	FU,TB,R
	P5	TB,(LABEL ONLY)
#14 RED	6	T,FU
	8	TB,(LABEL ONLY)
#14 RED	9	L,TB
#14 RED	10	L,R
	11	TB,(LABEL ONLY)
#14 RED	12	R,TB
#14 RED	13	R,L
#14 RED	60	R,TB
#14 WHITE	7	T,L,R,TB
#14 GREEN	7	T,TO PANEL GROUND



PANEL LAYOUT

BILL OF MATERIAL

NO REQ F1	DESCRIPTION	MATERIAL NO P&H	PART NO (PN) SEMI-FNSH(PN)	DEVICE DESIGNATOR	IT NO
1	PANEL		779E10042		1
					2
					3
					4
1	CIRCUIT BREAKER 350A		79Z3275011	CB	5
					6
					7
					8
1	CIRCUIT BREAKER 15A		79Z1917D201	CBC	9
1	TRANSFORMER 0.25KVA		75085D1	T	10
1	FUSE BLOCK 250V		79Z2189		11
1	FUSE 5A 250V		79Z753D2	FU	12
Ⓐ 1	REVERSER SIZE 4-1/2		479U47D1	L-R	13
					14
1	TERMINAL BLOCK		79E4164D15F15	TB	13
2	FELT WASHER		18H3849		16
					17
					18
					19
					20

Ⓐ See FURNAS BULL. 22GKF-B

NOTE:
ALL #4/0 WIRE TO BE TYPE XHHW P&H 2027
ALL OTHER WIRE TO BE TYPE THHN/THWN P&H 250
⬡ = EXTERNAL CONNECTIONS

29638

F1 — NEMA SIZE 4-1/2 REVERSER WITH 350A. CIRCUIT BREAKER

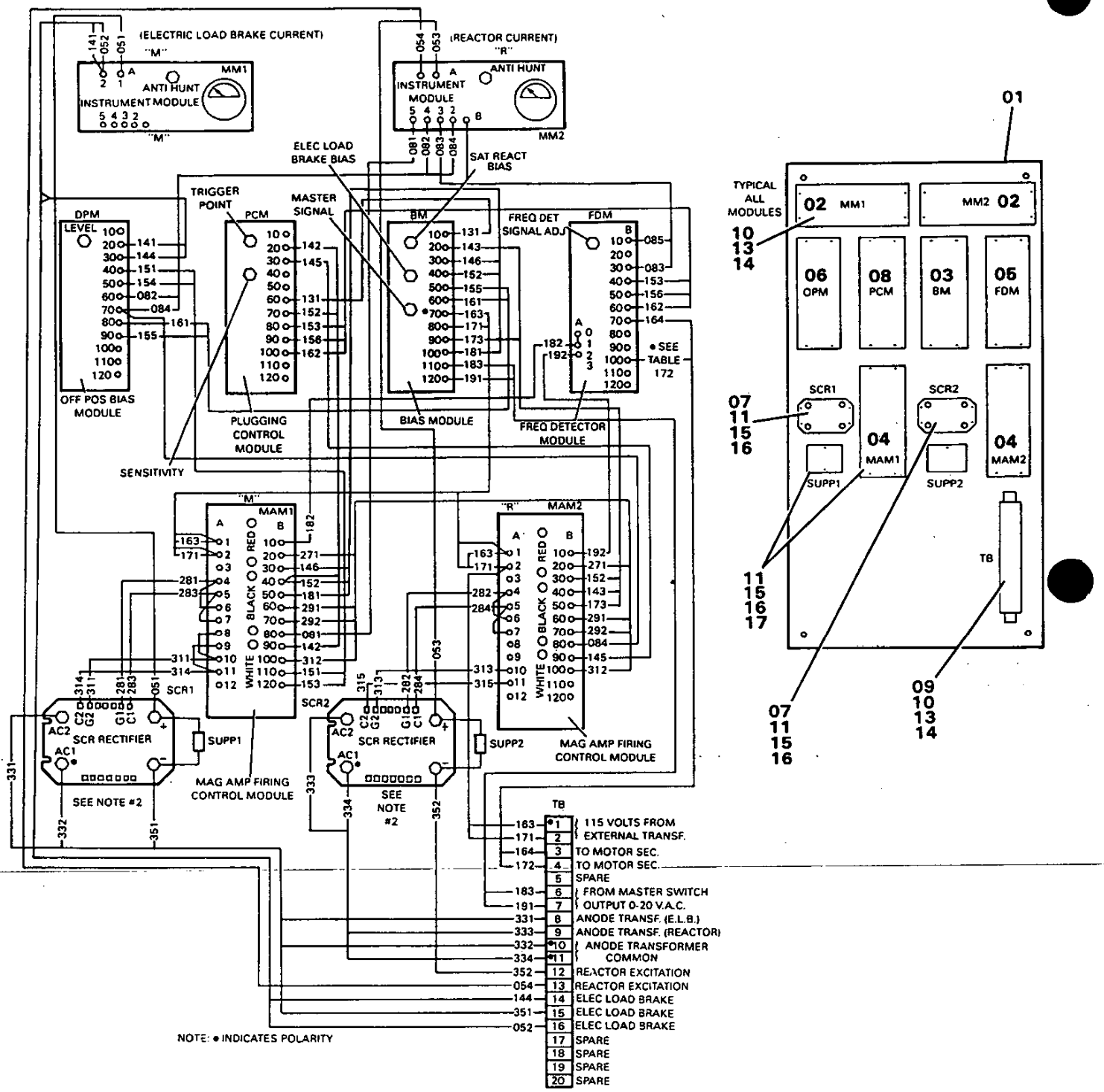
ALL DIMENSIONS ARE IN DECIMAL INCH (UNLESS OTHERWISE NOTED)

RFK 12-87
JCH
SCALE 1:4
STARTER PANEL
BULL. 562N/563N

CAD/CAM DRAWING - DO NOT MANUALLY CHANGE

979A2393F1

ILLUSTRATION NO. CI-46
STATIC CONTROL PANEL ASSEMBLY
979A300-3

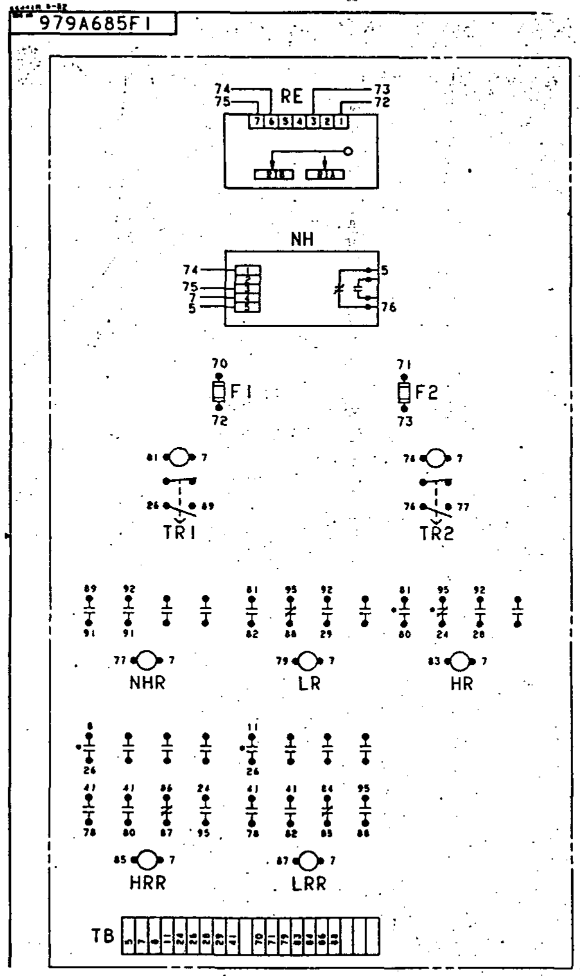


Harnischfeger P&H

WHEN ORDERING PARTS ALWAYS GIVE MODEL AND MACHINE SERIAL NUMBER

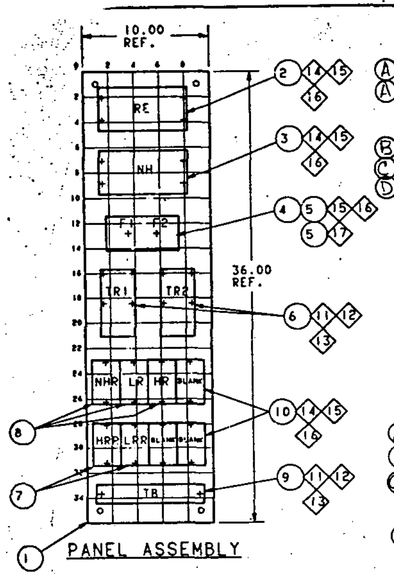
STATIC CONTROL PANEL ASSEMBLY
979A300-23 MAIN HOIST

ITEM	DESCRIPTION	PART NO.	QTY
1	PANEL	79E5749	1
2	MODULE, METER (MM1) (NOT AS SHOWN)	979F655-1	2
	MODULE, METER (MM2)	79U10D2	2
3	MODULE, BIAS (BM)	79U6D4	1
4	MODULE, MAG. AMP. (MAM1-MAM2)	79U5D2	2
5	MODULE, FREQUENCY DETECTOR (FDM)	79U8D5	1
6	MODULE, OFF POSITION BIAS (OPM)	79U16D2	1
7	RECTIFIER, SCR	75Z1047D2	2
8	MODULE, PLUGGING CONTROL (PCM)	79U9	1
9	TERMINAL BLOCK	79E4164D20F20	1
10	SCREW, MACH, PAN HD, 8-32 X 1/2 IN	0862V077	34
11	SCREW, MACH, PAN HD, 6-32 X 1/2 IN	0862V061	12
12	WIRE HARNESS	79U2483	1
13	LOCKWASHER, NO.8	3616V004	34
14	LOCKWASHER, NO.6	3616V003	34
15	PLAIN WASHER, NO.8	3631V003	12
16	PLAIN WASHER, NO.6	3631V002	12
17	SUPPRESSOR	79Z2475D6	2



WIRING DIAGRAM

WIRE COLOR & SIZE	WIRE NO.	DEVICE LOCATION
#14 BLACK	5	NH,NH,TB
#14 WHITE	7	NH,TR1,TR2,NHR,LR,HR, HRR,LRR,TB
#14 BLACK	8	HRR,TB
	11	LRR,TB
	24	HR,HRR,TB
	26	TR1,HRR,LRR,TB
	28	HR,TB
	29	LR,TB
	41	HRR,HRR,LRR,LRR,TB
	70	F1,TB
	71	F2,TB
	72	RE,F1
	73	RE,F2
	74	RE,NH
	75	RE,NH
	76	NH,TR2
	77	TR2,NHR
	78	TR2,HRR,LRR
	79	LR,TB
	80	HR,HRR
	81	TR1,HR,LR
	82	LR,LRR
	83	HR,TB
	84	LRR,TB
	85	HRR,LRR
	86	HRR,TB
	87	HRR,LRR
	88	LR,LRR,TB
	89	TR1,NHR
	91	NHR,NHR
	92	NHR,LR,HR
	95	LR,HR,HRR,LRR



PANEL ASSEMBLY

BILL OF MATERIAL

	NO REQ F1	DESCRIPTION	MATERIAL NO P&H		PART NO (PN)	DEVICE DESIGNATOR	IT NO
	1	PANEL			779E10010		1
(A)	1	RECTIFIER ASS'Y			100A6762-1	RE	2
(A)	1	ELECTRONIC RELAY			100E5237-2	NH	3
	1	FUSEBLOCK 600V-30A-2P			792134101		4
	2	FUSE 5A-600V			7929404	F1-F2	5
(B)	2	TIMED OFF - RELAY			792185806	TR1-TR2	6
(C)	2	AC CONTROL RELAY 8P			47906107	HRR-LRR	7
(D)	3	AC CONTROL RELAY 4P			47906007	NHR-LR-HR	8
	1	TERMINAL BOARD - 20			79E4164D20F20	TB	9
	2	RELAY MTG TRACK			47923401		10
	10	#8-32 X 1/2" PAN HEAD MACHINE SCREW			0862V077		11
	10	#8 HELICAL SPRING LOCKWASHER			3616V004		12
	10	#8 PLAIN WASHER			3631V003		13
	24	#10-24 X 1/2" PAN HEAD MACHINE SCREW			0862V096		14
	26	#10 HELICAL SPRING LOCKWASHER			3616V005		15
	26	#10 PLAIN WASHER			3631V004		16
	2	#10-24 X 3/4" PAN HEAD MACHINE SCREW			0862V099		17
							18
							19
							20

(A) See Illus. CC-85
(B) See A.B. Bull. 849-5.0
(C) 1- Coil 475Q8D1
8- Contact Cartridge 479Z36
(D) 1- Coil 475Q8D1
4- Contact Cartridge 479Z36

CRANE STANDARD

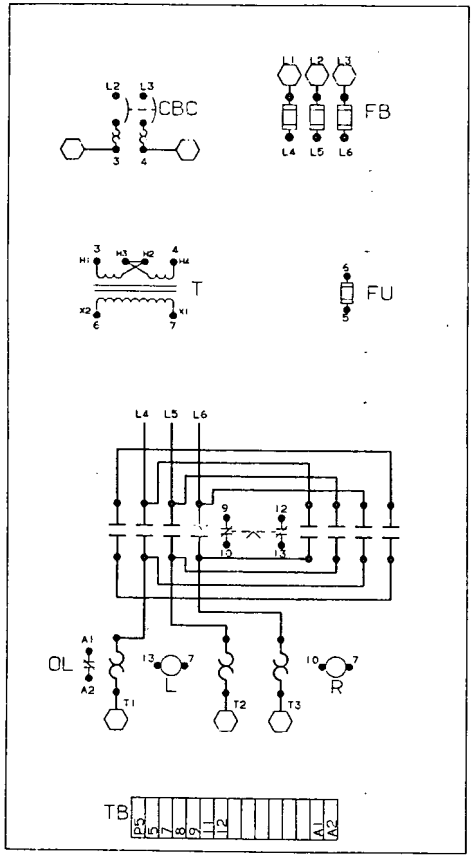
F1
ASS'Y & WIRING DIAGRAM FOR ACCEL / DECELL PANEL

P&H

ACCELL - DECELL PANEL

979A685F1

979A1817F_

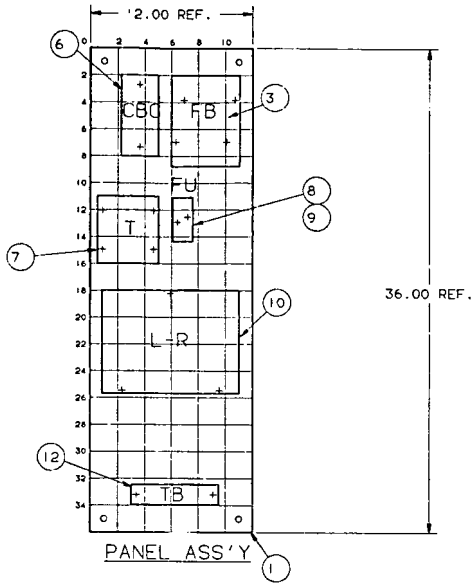


WIRING DIAGRAM

WIRE COLOR & SIZE	WIRE NO.	DEVICE LOCATION
#12 BLACK	L4	FB:L
#12 BLACK	L5	FB:L
#12 BLACK	L6	FB:L
#14 BLACK	L2	CBC:B
#14 BLACK	L3	CBC:B
#14 BLACK	3	CBC:T
#14 BLACK	4	CBC:T
#14 RED	5	FU:B
#14 RED	6	T:FU
	8	TB (LABEL ONLY)
#14 RED	9	L:B
#14 RED	10	L:B
	11	TB (LABEL ONLY)
#14 RED	12	L:B
#14 RED	13	T:L
#14 RED	A1	OL:B
#12 RED	A2	OL:B
	P5	TB (LABEL ONLY)
#14 WHITE	7	T:B, L:B
#14 GREEN	7	TO PANEL GRND.

NOTE:
ALL WIRE TO BE TYPE
THHN/THWN P&H 250

⬡ = EXTERNAL CONNECTIONS



PANEL ASS'Y

NO REQ	DESCRIPTION	MATERIAL NO. P&H	PART NO (PN) SEMI-FNSH(PN)	DEVICE DESIGNATION	ITEM NO
1	PANEL		779E1001-2		1
					2
1	FUSE BLOCK 30A.		79Z138105	FB	3
					4
					5
1	CIRCUIT BREAKER 15A		79Z191720-1	CBC	6
1	TRANSFORMER 0.25KVA		75G68D1	T	7
1	FUSE BLOCK 250V		79Z2189		8
1	FUSE 3A 250V		79Z9902	FU	9
1	REVERSER SIZE 1		479U196011	L-R	10
					11
1	TERMINAL BLOCK		79E416401-5F15	TB	12
					13
					14
					15
					16
					17
					18
					19
					20
					21
					22

(A) SEE ILLUS. FE-13-196

CRANE STANDARD

F_ NEMA SIZE 1 REVERSER WITH 30A. FUSE BLOCK

STARTER PANEL

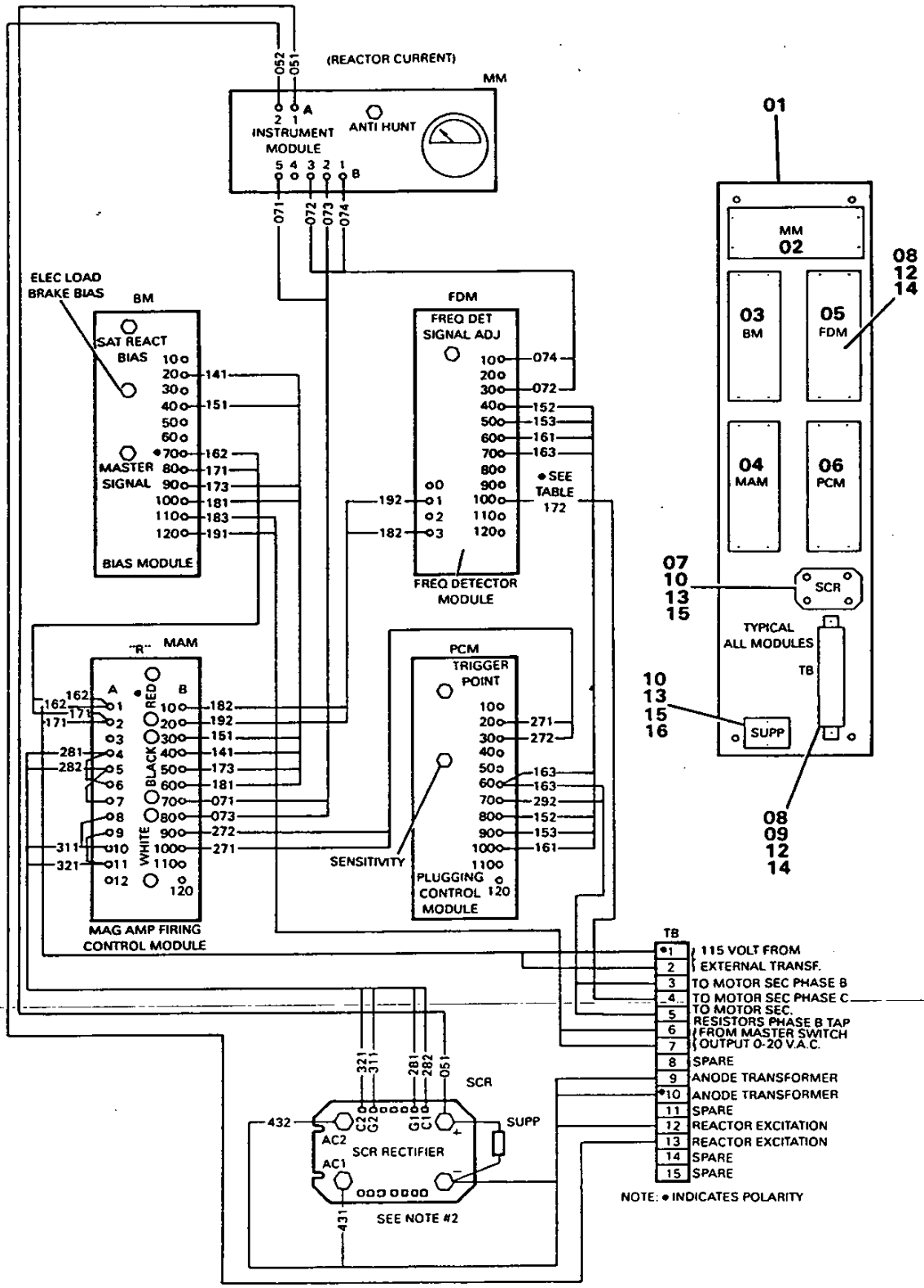
BULLETIN 562N/563N

979A1817F

DECIMAL INCH

CAD/CAM DRAWING - DO NOT MANUALLY CHANGE

ILLUSTRATION NO. C1-45
STATIC CONTROL PANEL ASSEMBLY
979A299-3



Harnischfeger
P&H

WHEN ORDERING PARTS ALWAYS GIVE MODEL AND MACHINE SERIAL NUMBER

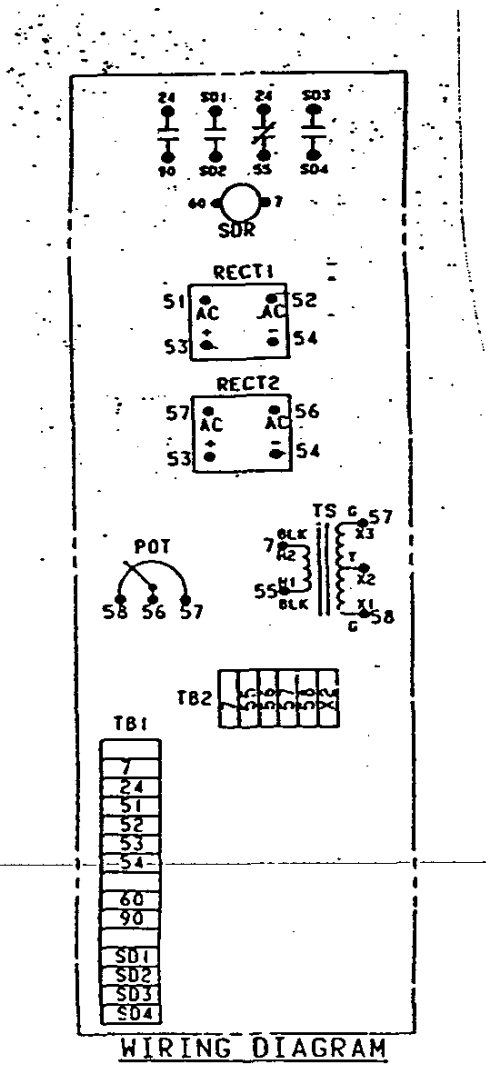
STATIC CONTROL PANEL ASSEMBLY
979A299-3 TROLLEY & BRIDGE

ITEM		DESCRIPTION	PART NO.	QTY
		PANEL ASSEMBLY	979A299F3	1
		INCLUDES ITEMS 1 THRU 16		
1		PANEL	79E5748	1
2	*	MODULE, METER (MM)	79U10D2	1
3	*	MODULE, BIAS (BM)	79U6D4	1
4	*	MODULE, MAG. AMP. (MAM)	79U5D2	1
5	*	MODULE, FREQUENCY DETECTOR (FDM)	79U8D5	1
6	*	MODULE, PLUGGING CONTROL (PCM)	79U9	1
7	*	RECTIFIER, SCR	75Z1047D2	1
8		SCREW, MACH, PAN HD, 8-32 X 1/2 IN	0862V077	22
9		TERMINAL BLOCK	79E4164D15-F15	1
10		SCREW, MACH, PAN HD, 6-32 X 1/2 IN	0862V061	6
11		WIRE HARNESS	979E368-1	1
12		LOCKWASHER, NO.8	3616V004	22
13		LOCKWASHER, NO.6	3616V003	6
14		PLAIN WASHER, NO.8	3631V003	22
15		PLAIN WASHER, NO.6	3631V002	6
16		SUPPRESSOR	79Z2475D6	1

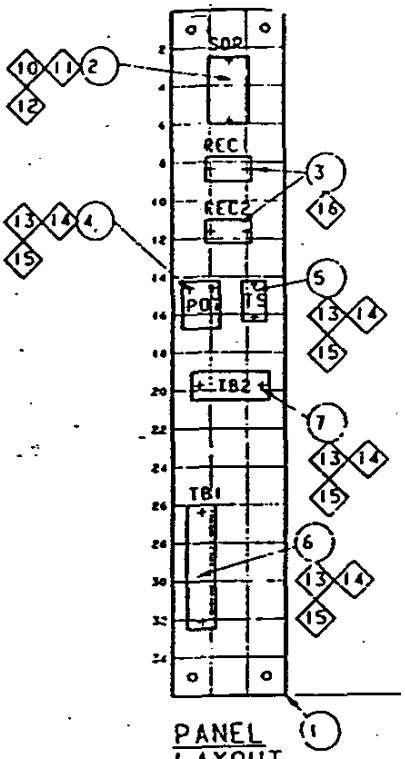
* - RECOMMENDED SPARE

SLOWDOWN PANEL

979A320F5



WIRING DIAGRAM



PANEL LAYOUT

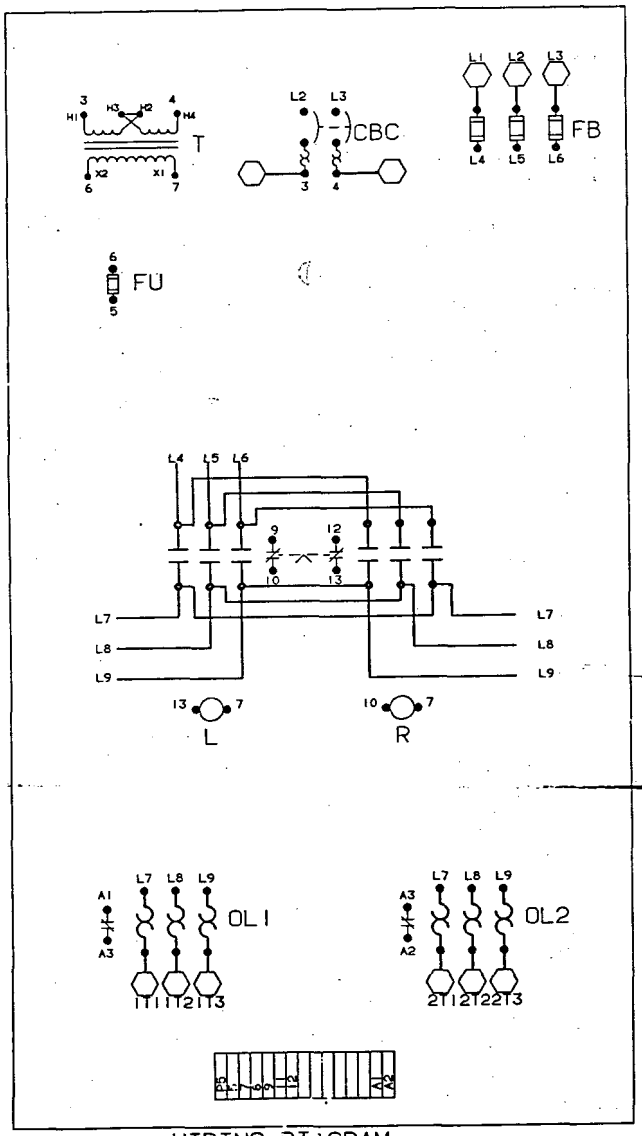
WIRE COLOR & SIZE	WIRE NO.	DEVICE LOCATION
#14 WHITE	7	SDR.TB2.TB1
#14 BLACK	24	SDR.SDR.TB1
#12 BLACK	51	RECT1.TB1
#14 BLACK	52	RECT1.TB1
#14 BLACK	53	RECT1.RECT2.TB1
#14 BLACK	54	RECT1.RECT2.TB1
#14 BLACK	55	SDR.TB2
#14 BLACK	56	RECT2.TB2.POT
#14 BLACK	57	RECT2.TB2.POT
#14 BLACK	58	POT.TB2
#14 BLACK	60	SDR.TB1
#14 BLACK	90	SDR.TB1
LEAD	7	TS.TB2
LEAD	55	TS.TB2
LEAD	57	TS.TB2
LEAD	57	TS.TB2
LEAD	58	TS.TB2
#14 BLACK	SD1	SDR.TB1
#14 BLACK	SD2	SDR.TB1
#14 BLACK	SD3	SDR.TB1
#14 BLACK	SD4	SDR.TB1

SLOWDOWN PANEL
979A320F5 TROLLEY & BRIDGE

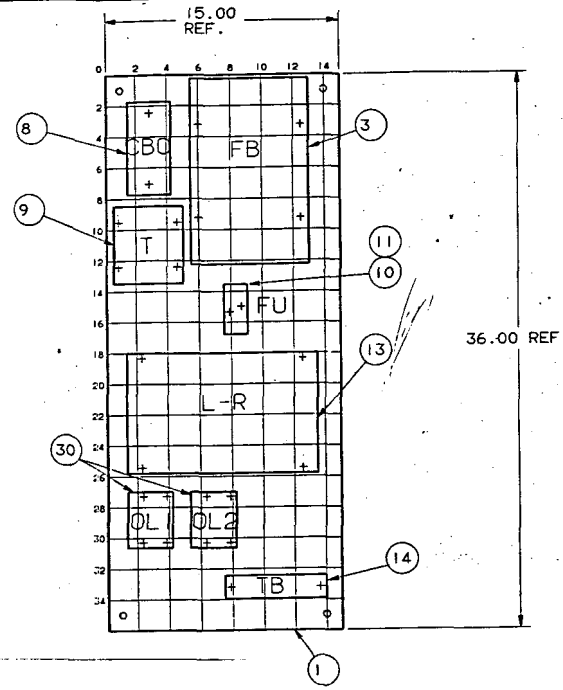
ITEM	DESCRIPTION	PART NO.	QTY
	NOTE: ITEMS NOT SHOWN ARE NOT USED:		
1	PANEL	779E10D6	1
2	CONTROL RELAY, AC 4P	479Q60D7	1
	COIL	475Q8D1	1
	CONTACT CARTRIDGE	479Z36	4
3	RECTIFIER	75Z348D1	2
4	POTENTIOMETER	979H149-1	1
5	TRANSFORMER	75Z624D1	1
6	TERMINAL BOARD - 15	79E4164D15F15	1
7	TERMINAL BOARD - 6	79Z1077D1	1
10	MACH SCREW, PAN HEAD #10-24 X 1/2"	0862V096	2
11	LOCKWASHER #10	3616V005	2
12	PLAIN WASHER #10	3631V004	2
13	MACH SCREW, PAN HEAD #8-32 X 1/2"	0862V077	8
14	LOCKWASHER #8	3616V004	8
15	PLAIN WASHER #8	3631V003	8
16	MACH SCREW, PAN HEAD #8-32 X 1-1/4"	0862V084	4

2234IM 6-82

DWG NO 979A1831F_



WIRING DIAGRAM



PANEL LAYOUT

WIRE COLOR & SIZE	WIRE NO.	DEVICE LOCATION
#4 BLACK	L4	FB.L
#4 BLACK	L5	FB.L
#4 BLACK	L6	FB.L
#8 BLACK	L7	L.OL1
#8 BLACK	L8	L.OL1
#8 BLACK	L7	R.OL2
#8 BLACK	L8	R.OL2
#8 BLACK	L9	R.OL2
#14 BLACK	L2	FB.CBC
#14 BLACK	L3	FB.CBC
	P5	TB(LABEL ONLY)
#14 BLACK	3	CBC.T
#14 BLACK	4	CBC.T
#14 RED	5	FU.TB
#14 RED	6	T.FU
	8	TB(LABEL ONLY)
#14 RED	9	L.TB
#14 RED	10	L.R
	11	TB(LABEL ONLY)
#14 RED	12	R.TB
#14 RED	13	R.L
#14 RED	A1	OL1.TB
#14 RED	A2	OL2.TB
#14 RED	A3	OL1.OL2
#14 WHITE	7	T.L.R.TB
#14 GREEN	7	T.TO PANEL GRND.

NOTE:
ALL #4 WIRE TO BE TYPE XHHW P&H 2027
ALL OTHER WIRE TO BE TYPE THHN/THWN P&H 250

⬡ = EXTERNAL CONNECTIONS

BILL OF MATERIAL

NO REQ'D	DESCRIPTION	MATERIAL NO P&H	MATERIAL NO * *	PART NO (PN) SEMI-FNSH(PN)	DEVICE DESIGNATOR	ITEM NO
1	PANEL			779E10015		1
						2
1	FUSE BLOCK 200A			79Z1381D10	FB	3
						4
						5
						6
						7
1	CIRCUIT BREAKER 15A			79Z19170201	CBC	8
1	TRANSFORMER 0.25KVA			750880I	T	9
1	FUSE BLOCK 250V			79Z2189		10
1	FUSE 3A 250V			79Z950C	FU	11
						12
1	STARTER SIZE 3			479U235D11	L-R	13
1	TERMINAL BLOCK			79E416401SF15	TB	14
						15
						16
						17
						18
						19
						20
						21
						22
						23
						24
						25
						26
						27
						28
						29
2	OVERLOAD RELAY 60A.			47904007	OL1-OL2	30

Ⓐ SEE ILLUS. FE-14-235

CRANE STANDARD

F_

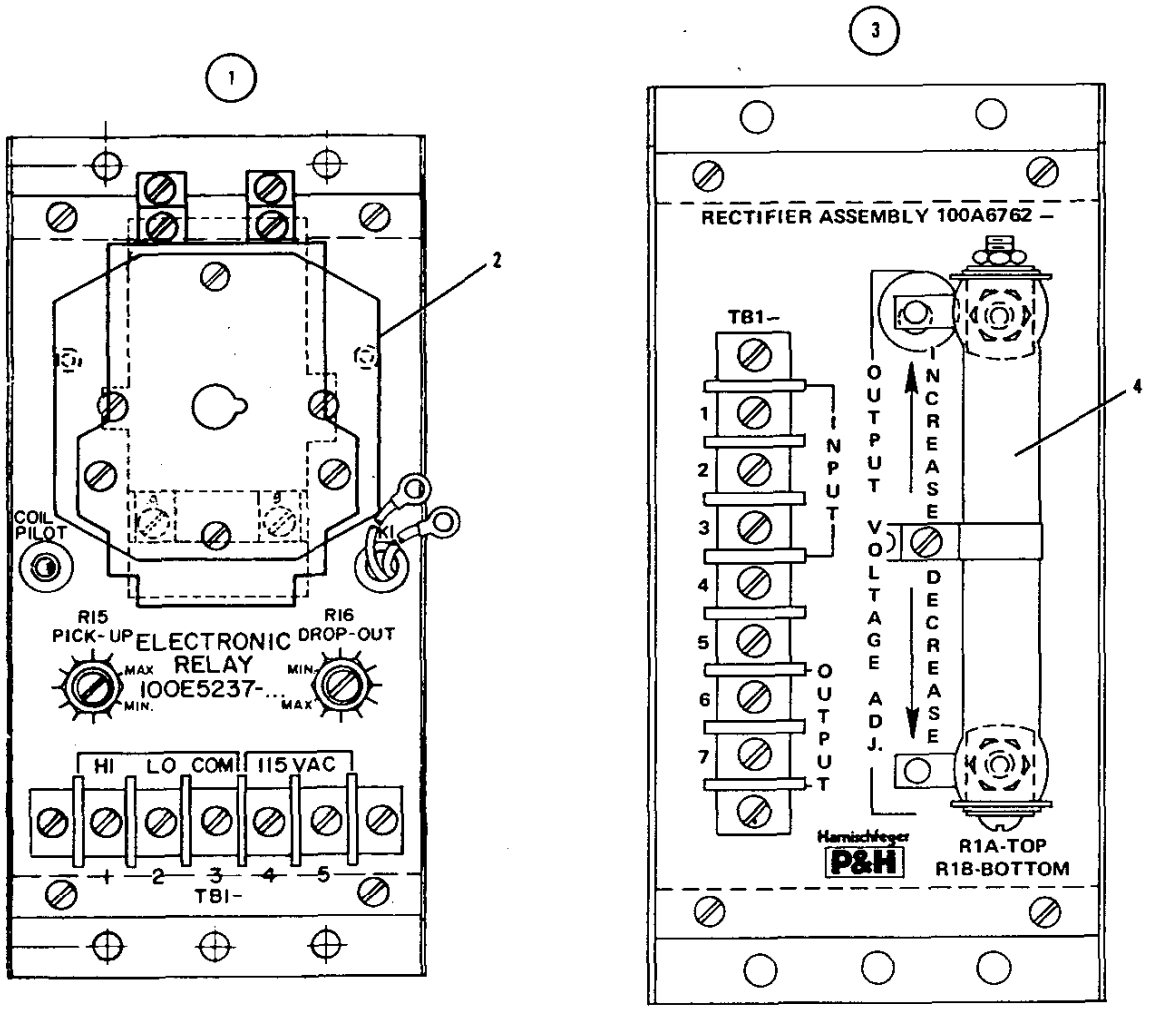
NEMA SIZE 3 REVERSER DUPLEX MOTION

DECIMAL INCH UNLESS OTHERWISE NOTED

CAD/CAM DRAWING - DO NOT MANUALLY CHANGE

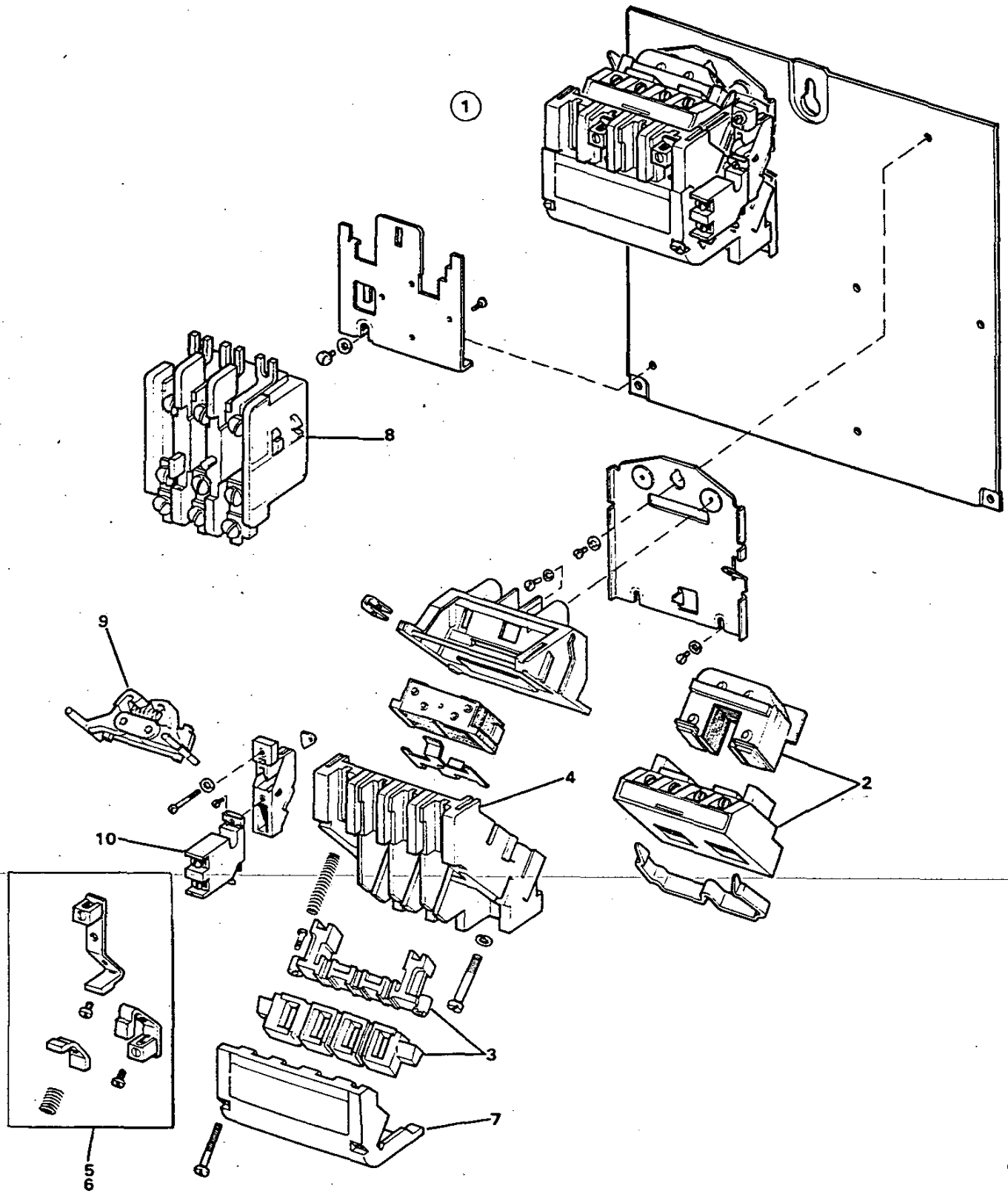
DRAWN M. KONKEL 11-10-86
CHKD W.JK 11-21-86
ENGR DND 11-21-86
RELEASE DATE 11-21-86
BASIC LIST NO
SCALE 1:4
TITLE STARTER PANEL
BULLETIN 562N/563N
DWG NO 979A1831F2
SH 1 OF 1

ILLUSTRATION NO. CC-85
ELECTRONIC RELAY AND RECTIFIER ASSEMBLY



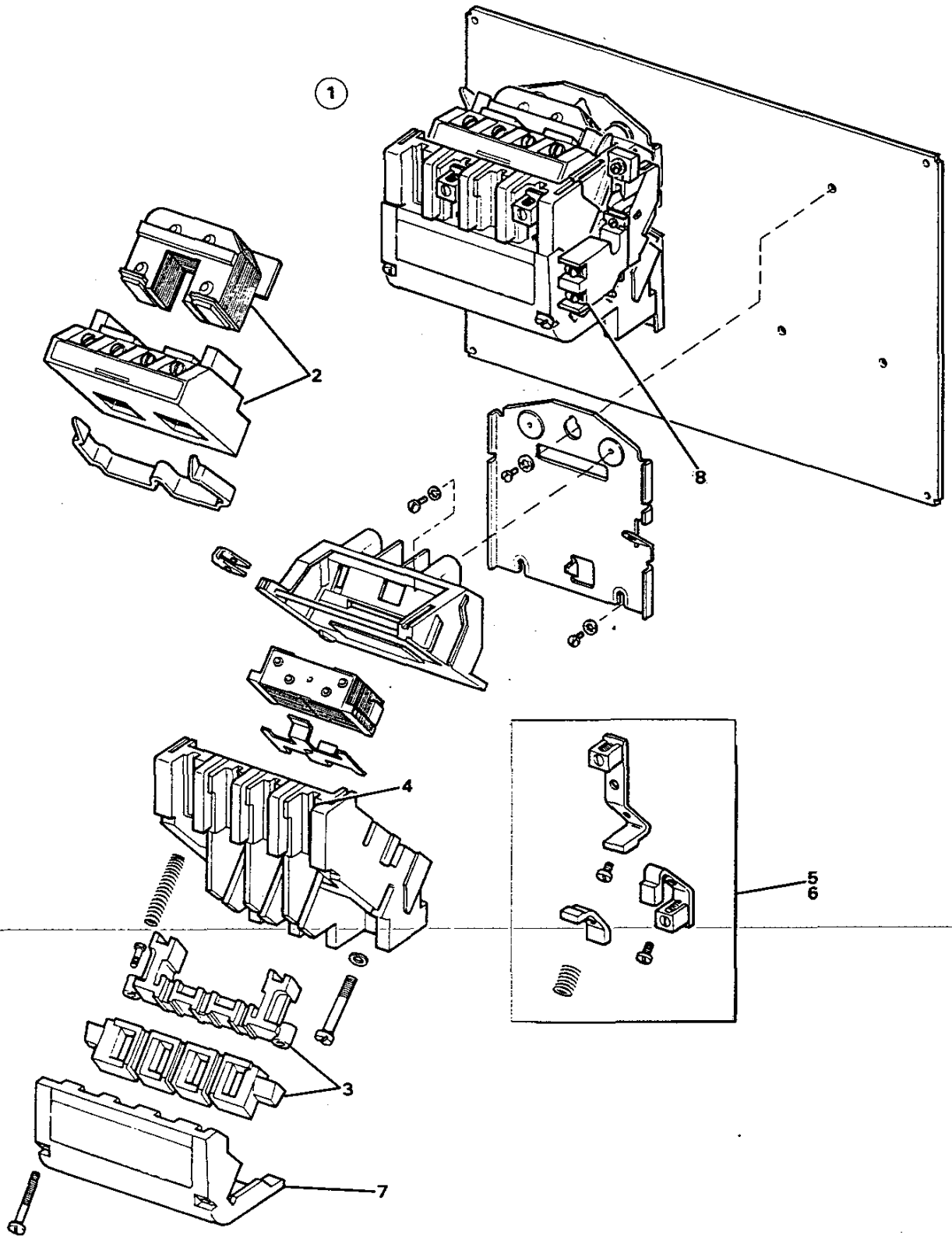
ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY.
1	ELECTRONIC RELAY (EACH INCLUDES ITEM 2).	100E5237-2	1
2	RELAY.	79Z1932-D2	1
3	RECTIFIER ASSEMBLY (EACH INCLUDES ITEM 4)	100A6762-1	1
4	ADJUSTABLE RESISTOR.	80Z969-D1	2

ILLUSTRATION NO. FE-13
REVERSING STARTER



Harnischfeger
P&H

ILLUSTRATION NO. FE-14
REVERSING SWITCH

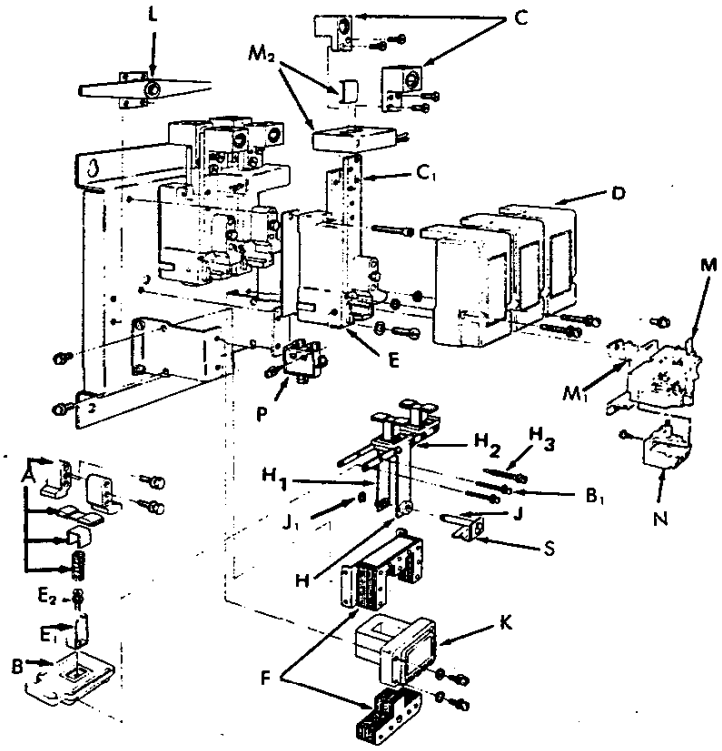


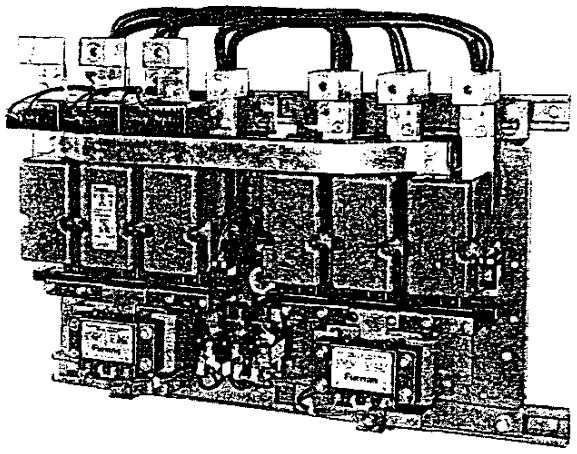
Harnischfeger
P&H

January, 1984

Reversing Starters, Multispeed Starters and Contactors
4½ & 5

Class 22, 30 & 43
22RF, 22KF, 30RF, 30KF, 43RB & 43KB
Series B





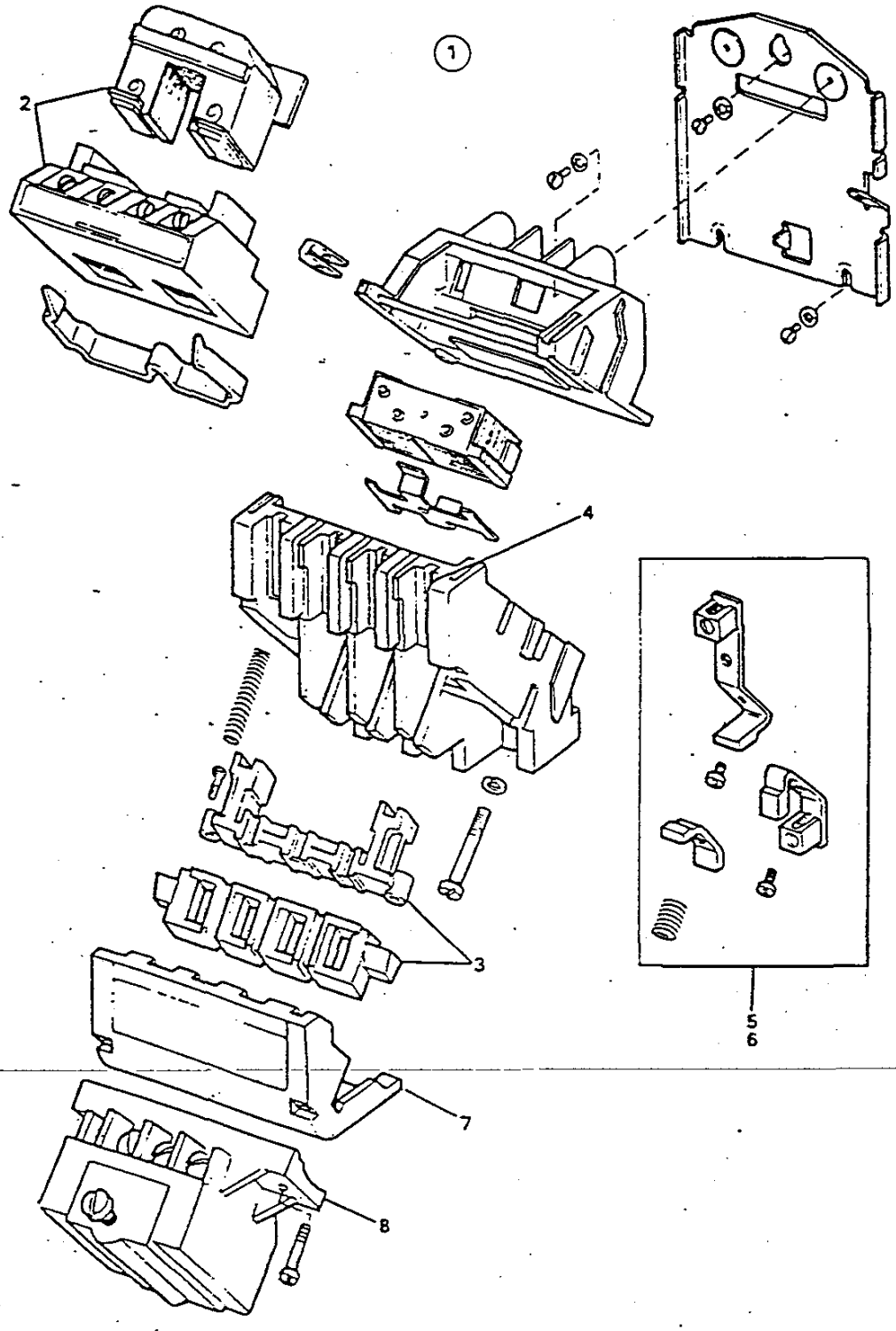
479U147-D1

Item	Part Description		Part Number
A	Contacts, Spring, and Spring Shield		
	One Complete Pole	Size 4½	75RB14
		Size 5	75KB14
B	Cross Arm (less contacts)		D52051003
B_1	Cross Arm Screw — Size ¼-28x2 Rd Hd		S00114032
C	Lug		
	Size 4½ & 5 Aluminum	Front	D18748002
	Size 4½ & 5 Aluminum	Rear	D18749002
	Size 4½ & 5 Copper	Front	D29072002
	Size 4½ & 5 Copper	Rear	D29072002
C_1	Lug and Contact Support		
	Size 4½	Front	D52118002
	Size 5	Front	D52118001
	Size 4½	Rear	D18756002
	Size 5	Rear	D18756001
D	Contact Board Cover with Screws		
	Size 4½ One Pole		D52087004
	Size 5 One Pole		D52087003
E	Contact Board (less hardware)		
	Size 4½ One Pole		D20746004
	Size 5 One Pole		D20746003
E_1	Contact Guide		D12101001
E_2	Contact Guide Screw		
	Size ¼-20x½ Fil Hd Sems		S00227008
F	Magnet and Armature		D18826001
H	Front Pusher Assembly		D17066003

Item	Part Description		Part Number
H_1	Rear Pusher Assembly		D17066004
H_2	Pusher Screw — Size ¼-28x2 ¼		S00114036
H_3	Pusher Screw		D18945001
J	Armature Pin		D18742001
J_1	Armature Pin Retaining Ring		S00183006
K	Coil		
	60 Hertz	50 Hertz	
	110-120v/220-240v	110v/190-220v	D72069031
	220-240v/440-480v	190-220v/380-440v	D72069032
	550-600v	550v	D72069033
	For other voltages specify the number stamped on the coil.		
L	Mechanical Interlock Assembly	Size 4½	D18951003
		Size 5	D18951001
M	Thermal Overload Relay		
	Melting Alloy (Std)		48DC31A4S9
	Bimetal		48DC37A4
	Amb Comp Bimetal		48DC38A4
M_1	Overload Support Bracket		D54892001
M_2	Current Transformer and Clip		48KBIT
N	Melting Alloy Overload Kit — NO Contact		48ACNO
P	Auxiliary Interlock SPDT		
		Left Hand Side	49L100103
		Right Hand Side	49L100102
S	Retaining Clip		D18760001
	Split Lock Washer for B_1, H_1, H_2		S00122006

NOTE: When ordering replacement parts, give catalog number of control and part description and number.

ILLUSTRATION NO. FE-12
CONTACTOR



Harnischfeger
P&H

WHEN ORDERING PARTS ALWAYS GIVE MODEL AND MACHINE SERIAL NUMBER

MISCELLANEOUS ELECTRICAL EQUIPMENT
-NOT ILLUSTRATED-

ITEM	DESCRIPTION	PART NO.	QTY
1	MAIN HOIST ANODE TRANSFORMER.....	75Z1023D1	1
2	TROLLEY & BRIDGE ANODE TRANSFORMER	75Z1021D1	1
3	MAINLINE DISCONNECT..... SEE FURNAS BULL. 40-GKB FOLLOWING	479Q44D20	1
4	MAINLINE DISCONNECT FUSES 400 AMP.....	79Z754D29	3
5	BRIDGE LIGHT SAFETY SWITCH 2 POLE 600 VOLT.	79Z3071D1	1
6	BRIDGE LIGHT SAFETY SWITCH FUSES 15 AMP....	79Z96D7	2
7	BRIDGE LIGHTS.....	79U2403D604	3
8	BRIDGE REMOTE POWER CONNECTOR.....	79U2403D402	3
9	BRIDGE LIGHT BALLASTS.....	79U2403D118	3
10	BALLASTS HORZ. MOUNTING BRACKET.....	79U2403D201	3
11	UTILITY SAFETY SWITCH 2 POLE 600 VOLT.....	79Z3071D1	1
12	UTILITY SAFETY SWITCH FUSES 15 AMP.....	79Z96D7	2
13	GRAPPLE DISCONNECT..... SEE FURNAS BULL. 17-GCF-4X FOLLOWING	479Q70D2	1
14	GRAPPLE DISCONNECT FUSES 225 AMP.....	79Z754D34	3
15	HEATER ELEMENT GRAPPLES.....	480Z5D104	3
16	CAB START STOP.....	79Z1188	1
17	CAB GRAB OPEN - CLOSE.....	79Z1306D2	1
18	WARNING DEVICE FOOT SWITCH	479Z32	1
19	WARNING DEVICE.....	47Z46D1	1
20	AIR CONDITIONER RECEPTACLE 120VAC 15 AMP...	79Z2146D1	1

MISCELLANEOUS ELECTRICAL EQUIPMENT
-NOT ILLUSTRATED-

ITEM	DESCRIPTION	PART NO.	QTY
21	AIR CONDITIONER RECEPTACLE BOX.....	87Z46D4	1
22	CAB LIGHT W/SWITCH ..... SEE DRAWING FOLLOWING	3100F2110-1	1
23	UTILITY LOAD CENTER.....	79Z3421D3	1
24	UTILITY BRAKES 15 AMP.....	79Z3420F1	5
25	UTILITY BRAKES 30 AMP.....	------	1
26	CAB LIGHT FLOOD.....	56Z293D1	1
27	CAB LIGHT FLOOD GUARD.....	56Z293D4	1
28	CAB LIGHT FLOOD SWITCH	79Z2145	1
29	BOX.....	87Z46D4	1
30	PILOT LIGHT STATION	100H643-2	1
	ENCLOSURE	79Q413D4	1
	PUSH BUTTON	79Z1843D35	1
	PILOT LIGHT	79Z2718D7	3
31	ACCUMALATING HOUR METER.....	89Z837	1
32	UTILITY TRANSFORMER.....	75Q17D106	1
	AIR CONDITIONER SAFETY SWITCH 2POLE 600VOLT	79Z3071D1	1
	AIR CONDITIONER SAFETY SWITCH FUSES 30 AMP.	79Z754D13	2

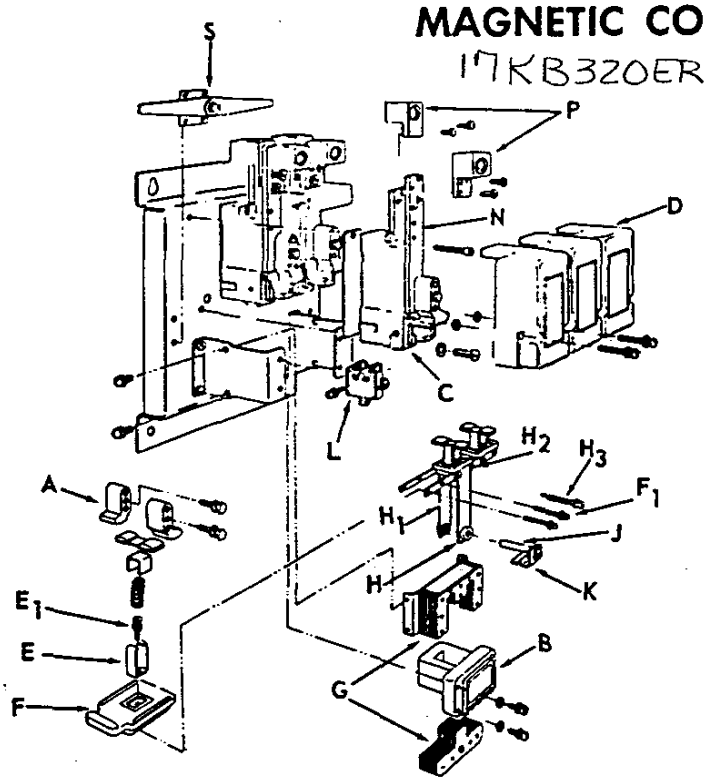
Supersedes issue of September, 1963 479Q44D20

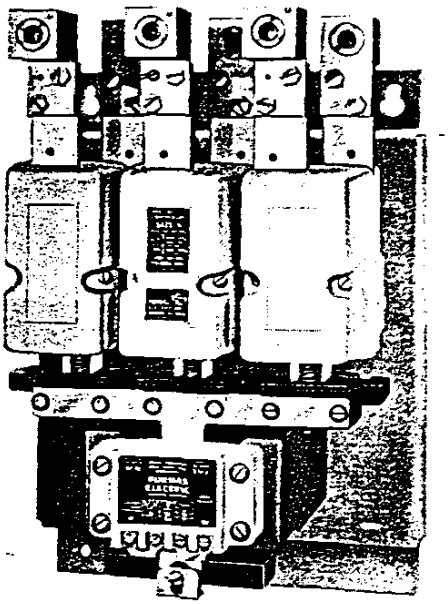
REPLACEMENT PARTS

MAGNETIC CONTACTORS

17KB320ERA-BAR

FILE NO.	40-GKB
CAT. NO. OR CLASS SERIES	40RB & 40KB
SIZE	4½ & 5
	JANUARY, 1966





ITEM	PART NAME		PARTS NUMBER 40RB SIZE 4½	PARTS NUMBER 40KB SIZE 5
A	Contacts and Spring One (1) Complete Pole – Specify No. Required		75RB14	75KB14
B	Coil* (50/60 Cycle)	110-220 Volts	D72069-31	D72069-31
		220-440 Volts	D72069-32	D72069-32
	*Other voltages and frequencies available on request.	550 Volts	D72069-33	D72069-33
C	Contact Board (Less Hardware)	One (1) Pole	D20746-2	D20746-1
D	Contact Board Cover with Screws	One (1) Pole	D52087-2	D52087-1
E	Contact Guide		D12101-1	D12101-1
E_1	Contact Guide Screw – Size ¼ – 20 x ½ Fil. Hd. Sems		S-227-8	S-227-8
F	Cross Arm (Less Hardware)		D52051-3	D52051-3
F_1	Cross Arm Screw – Size ¼ – 28 x 2 Rd. Hd.		S-114-32	S-114-32
G	Magnet and Armature		D18826-1	D18826-1
H	Front Pusher Assembly		D17066-3	D17066-3
H_1	Rear Pusher Assembly		D17066-4	D17066-4
H_2	Pusher Screw – Size ¼ – 28 x 2¼		S-114-36	S-114-36
H_3	Pusher Screw for Reversing		D18945-1	D18945-1
	Split Locker Washer for F_1, H_1, H_2		S-122-6	S-122-6
J	Armature Pin		D18742-1	D18742-1
K	Armature Pin Retaining Clip		D18760-1	D18760-1
L	Switchlets – Interlock – Kit (Max. 2 each side)	Left	49L100103	49L100103
		Right	49L100102	49L100102
N	Terminal	Front	D52118-2	D52118-1
		Rear	D18756-2	D18756-1
P	Terminal Lug	Front	D18748-2	D18748-2
		Rear	D18749-2	D18749-2
S	Mech. Interlock for Reversing		D18951-1	D18951-1

NOTE: When ordering replacement parts, give catalog number of control and part number.

Furnas

Replacement Parts

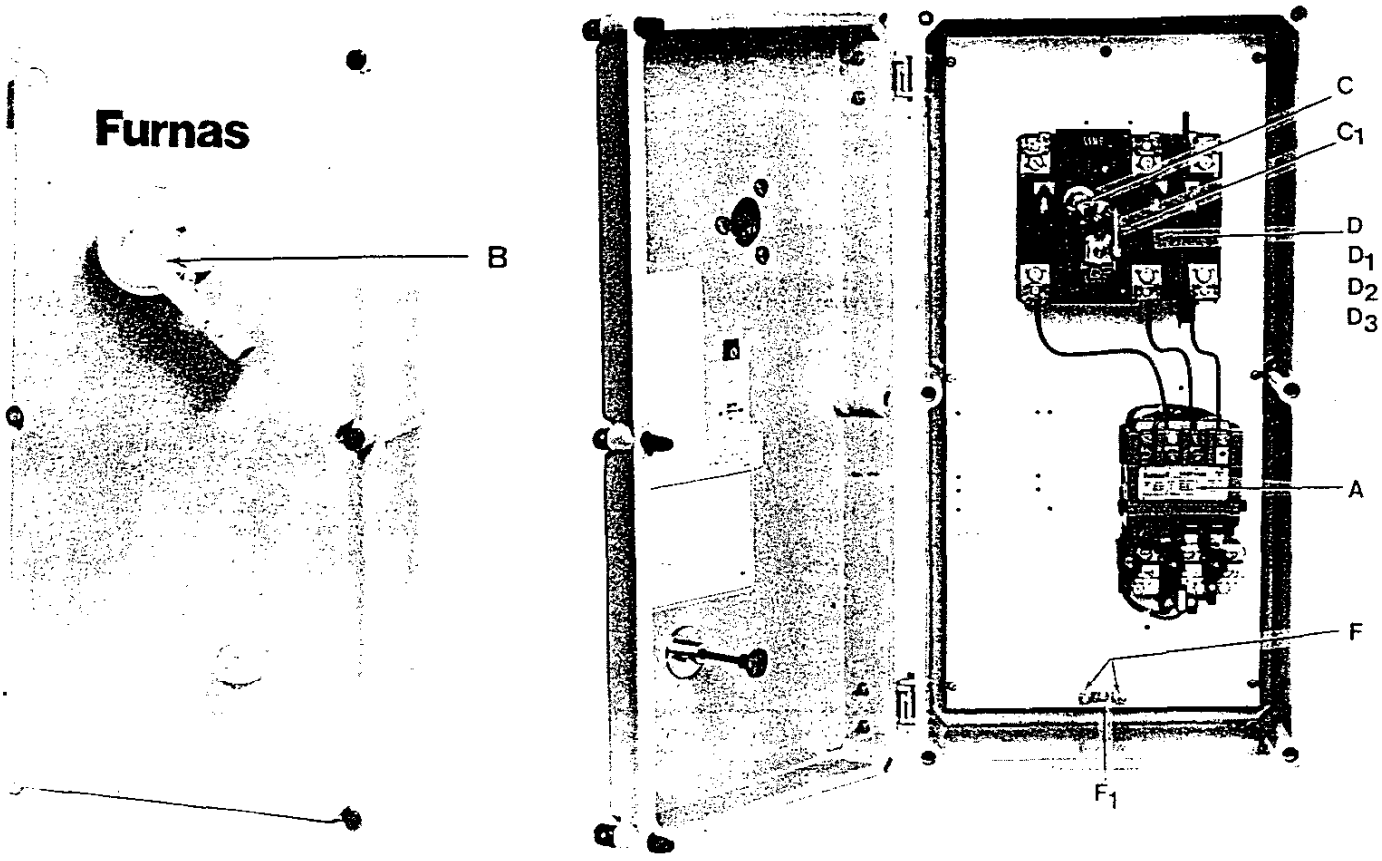
17-GCF-4X

July, 1985
Supersedes Issue of
November, 1984

Combination Starters & Contactors
0, 1, 1¾, 2, 2½, 3, 3½ & 4
NEMA 4X

Class 17 & 18
17CF, 17DF, 17EF, 17FF,
17GF, 17HF, 17IF, 17JD,
18CF, 18DF, 18EF, 18FF,
18GF, 18HF, 18IF, 18JD

479Q70D2 17JD320ERA-B4



Item	Part Description	Part Number
A	Motor Starter or Contactor	See Device Label or Appropriate Replacement Parts Sheet
B	Operating Handle	D42450002
C	Shaft	
	Size 0 thru 3 with Disconnect Switch	D42453001
	Circuit Breaker, Motor Circuit Protector and Size 3½, 4 with Disconnect Switch	D42451001
C_1	Mechanism	
	Circuit Breaker and Motor Circuit Protector	D61038001
	Size 3½, 4 with Disconnect Switch	D61038005
D	Disconnect Switch 250/600V (Less Fuse Clips)	
	See Item E for Disconnect Rating Versus Starter Size — Fusible 30A	D61096002
	60A	D61096006
	100A	D61096008
	200A	D63840010
	Non-Fusible 30A	D61096001
	60A	D61096005
	100A	D61096007
	200A	D63840004

NOTE: When ordering replacement parts, give catalog number of control and part name and number.

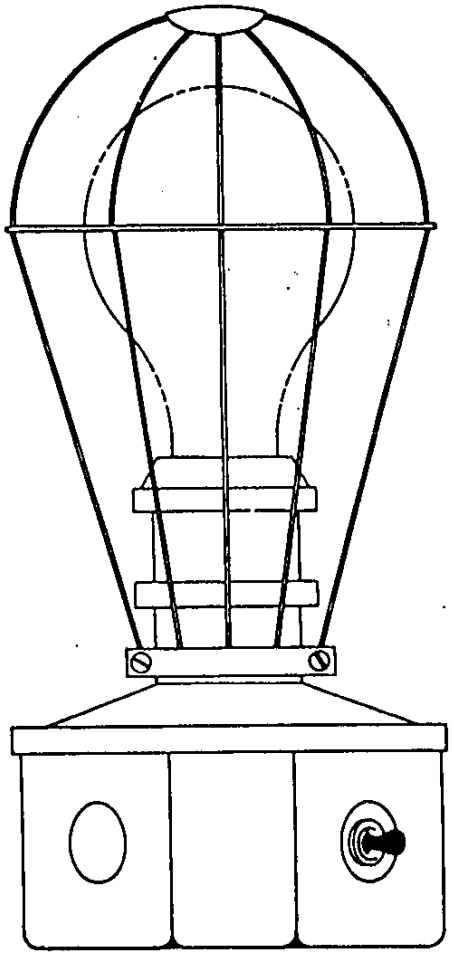
Replacement Parts

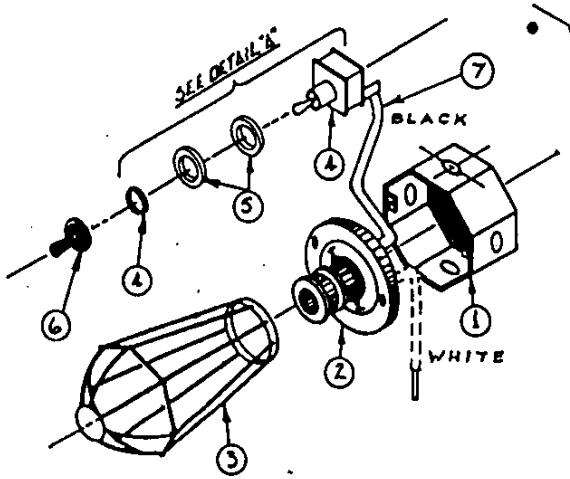
Item	Part Description	Circuit Breaker Rating	Part Number
D_1	*Thermal Magnetic Circuit Breaker*		
	8th Digit of Standard Cat Number will be "G"	15A	18TBGB
		20A	18TBGC
		40A	18TBGE
	Match 9th Digit of Standard Cat. Number with Last Digit of Part Number	50A	18TBGF
		90A	18TBGV
		100A	18TBGI
D_2	Motor Circuit Protector		
	8th Digit of Standard Cat Number will be "M"	3A	18TBMW
		7A	18TBM4
		15A	18TBM8
	Match 9th Digit of Standard Cat. Number with Last Digit of Part Number	30A	18TBMD
		50A	18TBMF
		100A	18TBMI
		150A	18TBMK
D_3	Current Limiter for Motor Circuit Protector		
	8th Digit of Standard Cat Number will be "N"	3A	18TBMWL
		7A	18TBM4L
		15A	18TBMBL
	Match 9th Digit of Standard Cat. Number with Next to Last Digit of Part Number	30A	18TBMDL
		50A	18TBMFL
		100A	18TBMIL
		150A	18TBMKL

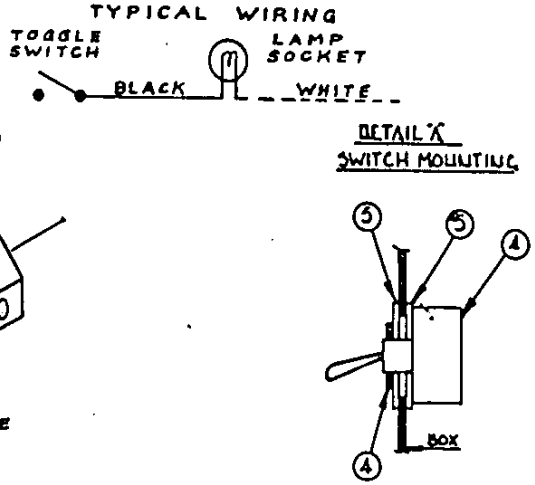
Item	Part Description	Starter Size	Disconnect Rating	Fuse Clip Rating	Part Number
E	Fuse Clips				
		0 thru 1¾	30A	Non-Fuse	D42422001
				30A, 250V	D61032001
				30A, 600V	D61032004
				60A, 250V	D61032002
				60A, 600V	D61032005
		2, 2½	60A	Non-Fuse	D42422002
				60A, 250V	D61097002
				60A, 600V	D61097006
				100A, 250V	D61097003
				100A, 600V	D61097007
				200A, 250V	D61097004
				200A, 600V	D61097008
		3	100A	Non-Fuse	D42422002
				100A, 250V	D61097003
				100A, 600V	D61097007
				200A, 250V	D61097004
				200A, 600V	D61097008
		3½, 4	200A	200A, 250V	D61097004
				200A, 600V	D61097008
	8th Digit of Standard Cat. Number Indicates Fuse Clip Voltage: D = 250V, E = 600V				
	9th Digit of Standard Cat. Number Indicates Fuse Clip Amperage: D = 30A, G = 60A, I = 100A, M = 200A				
F	Ground Lug				D11960001
F_1	Ground Lug Screw				S00191009

NOTE: When ordering replacement parts, give catalog number of control and part name and number.

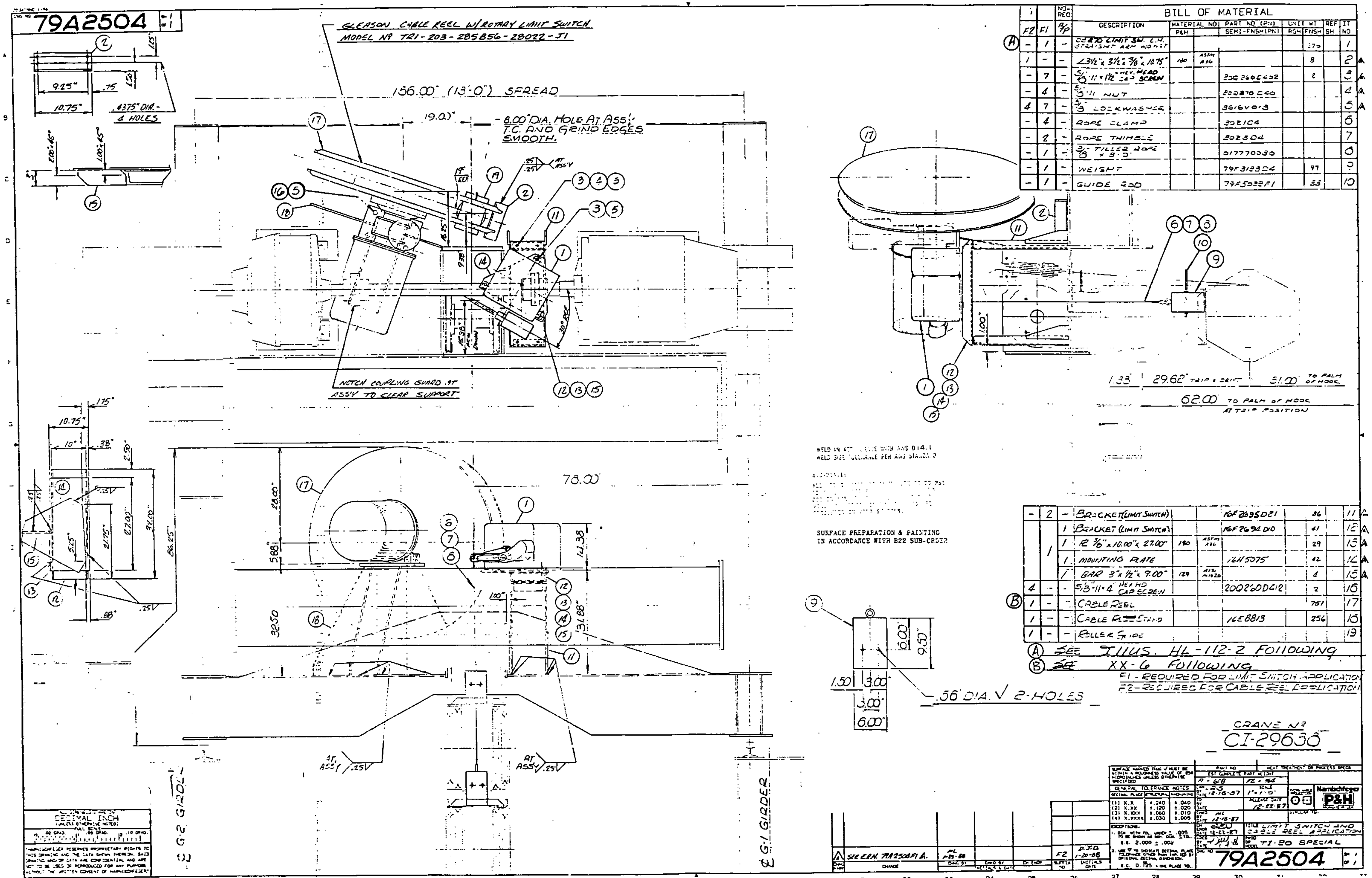
CAB LIGHT ASSEMBLY
3100F2110-F1







ITEM	DESCRIPTION	PART NO.	QTY
1	OCATAGON OUTLET BOX	87Z46D4	1
2	LAMP SOCKET	36Z48	1
3	LAMP GUARD	14Z93	1
4	TOGGLE SWITCH	79Z608	1
5	REDUCE WASHER	18Z3026D1	1
6	TOGGLE SWITCH BOOT	79Z2005	1
7	#14 THHN/TNWN WIRE BLACK (MEASURE IN FEET).	025081290	.5



SURFACE PREPARATION & PAINTING IN ACCORDANCE WITH B22 SUB-ORDER

BILL OF MATERIAL

	F2	F1	NO. REQ B/P	DESCRIPTION	MATERIAL NO P&H	PART NO (P/N) SEMI-FNSH (P/N)	UNIT WT RGH	UNIT WT FNSH	REF SH	IT NO.
Ⓐ	-	/	-	CC270 LIMIT SW. C.W. STRAIGHT ARM MOUNT				170		1
	/	-	-	∠3½" x 3½" x ⅜" x 12.75"	180 ASTM A36			8		2 ▲
	-	7	-	⅝-11 x 1½ HEX HEAD CAP SCREW		200260C432		2		3 ▲
	-	4	-	⅝-11 NUT		202870C60				4 ▲
	4	7	-	⅝ LOCKWASHER		3816V013				5 ▲
	-	4	-	ROPE CLAMP		202104				6
	-	2	-	ROPE THIMBLE		202304				7
	-	/	-	⅜ TILLER ROPE x 9'-0"		017770030				8
	-	/	-	WEIGHT		79F312304		97		9
	-	/	-	GUIDE ROD		79F5033F1		35		10

	F2	F1	NO. REQ B/P	DESCRIPTION	MATERIAL NO P&H	PART NO (P/N)	UNIT WT		IT NO.
	-	2	-	BRACKET (LIMIT SWITCH)		16F2695D21	86		11 ▲
		/		BRACKET (LIMIT SWITCH)		16F2696D10	41		12 ▲
	/	/		PL ⅜" x 10.00" x 27.00"	180 ASTM A36		29		13 ▲
		/		MOUNTING PLATE		16H5075	42		14 ▲
		/		BAR 3" x ½" x 9.00"	129 AISI M1020		4		15 ▲
	4	-	-	⅝-11 x 4 HEX HD CAP SCREW		200260D412	2		16
Ⓑ	/	-	-	CABLE REEL			751		17
	/	-	-	CABLE REEL STAND		16E8813	256		18
	/	-	-	ROLLER GUIDE					19

Ⓐ SEE ILLUS. HL-112-2 FOLLOWING

Ⓑ SEE XX-6 FOLLOWING

F1 - REQUIRED FOR LIMIT SWITCH APPLICATION

F2 - REQUIRED FOR CABLE REEL APPLICATION

CRANE NO CI-29630

DECIMAL INCH

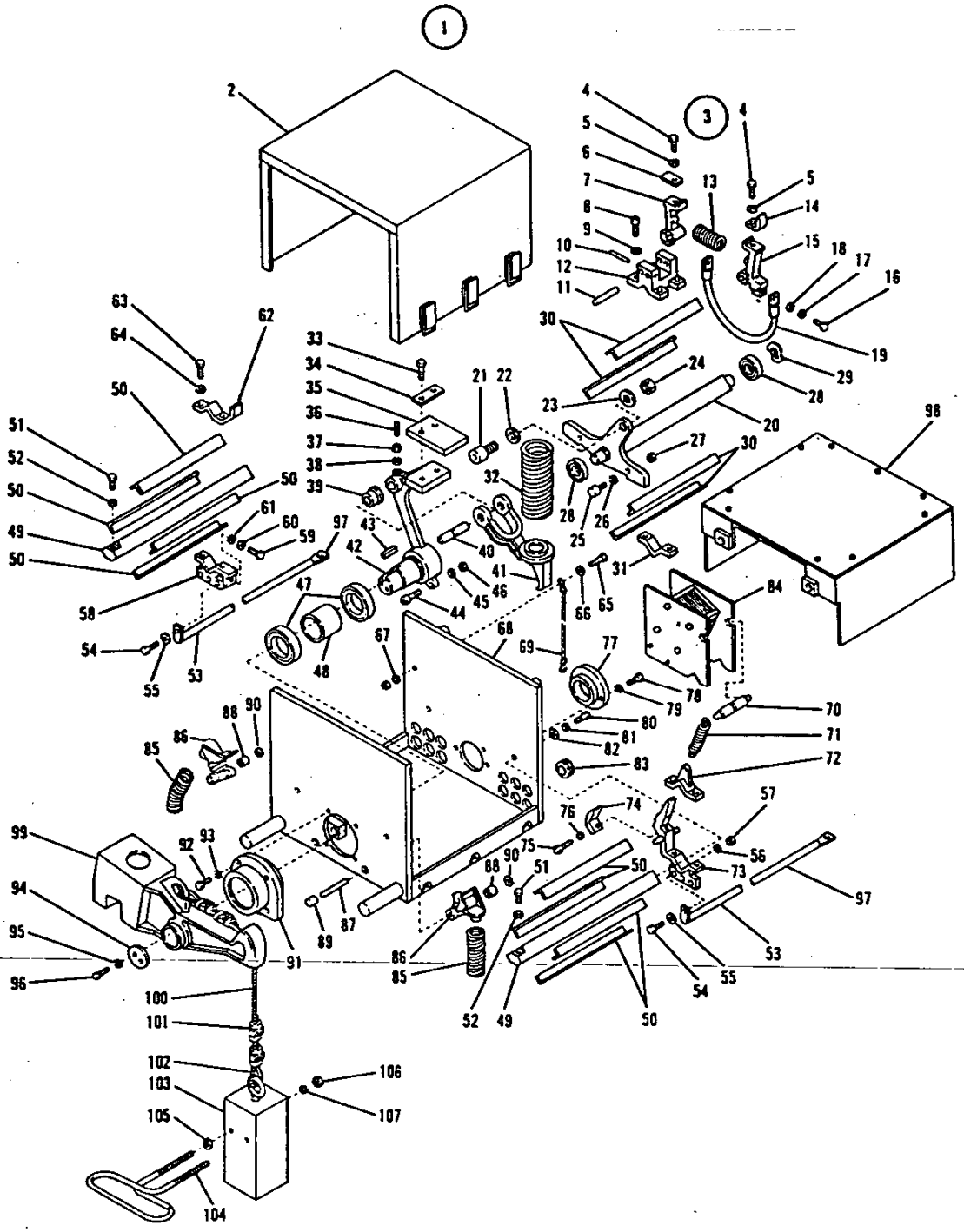
SEE E.R.N. 79A2504F1 A.

TITLE: LIMIT SWITCH AND CABLE REEL APPLICATION TI-80 SPECIAL

Harnischfeger P&H

DWG NO 79A2504

ILLUSTRATION NO. HL-112
DB LIMIT SWITCH WITHOUT AUXILIARY CONTACTS



Harnischfeger
P&H

WHEN ORDERING PARTS ALWAYS GIVE MODEL AND MACHINE SERIAL NUMBER

TYPE DB-270 AC POWER LIMIT SWITCH-DUPLEX
(NOT EXACTLY AS SHOWN:)

ITEM	DESCRIPTION	PART NO.	QTY
	NOTE: TO ORDER A COMPLETE LIMIT SWITCH, WHICH INCLUDES ITEM 99, USE PART NO. 100E5242-2.		
	MAIN HOIST		
1	LIMIT SWITCH ASSEMBLY, DUPLEX ..... CONSISTS OF ITEMS 2 THRU 98	100A6678-2	1
2	COVER	87A6D1	1
3	TRIP SHAFT SUB-ASSEMBLY ..... INCLUDES ITEMS 4-27, 30 AND 31	979A87-2	1
4	CAPSCREW, HEX HD, 3/18-16 X 7/8 IN	20Q260D257	4
5	LOCKWASHER, 3/8 IN, EXTRA DUTY	3643V011	4
6	STOP	29H1057	2
7	CONTACT LEVER, MOVABLE	6E286	2
8	CAPSCREW, HEX HD, 5/16-18 X 1-1/4 IN	20Q260D228	8
9	LOCKWASHER, 5/16 IN, EXTRA DUTY	3643V010	8
10	SPRING PIN, 0.156 X 1.875 IN	19Z223D77	2
11	PIN	19H3330	4
12	ARM SUPPORT	16E4349	2
13	SPRING	17Z518	2
14 *	CONTACT TIP	79H1876	2
15	CONTACT LEVER, MOVABLE	6E227	2
16	CAPSCREW, HEX HD, 3/8-16 X 1 IN	20Q260D258	2
17	LOCKWASHER, 3/8 IN, EXTRA DUTY	3643V011	2
18	PLAIN WASHER, 3/8 IN	3631V007	2
19	AC SHUNT	79F3161	2
20	TRIP SHAFT (INCLUDES ITEMS 21 THRU 27) ...	10E137D1	1
21	CAM FOLLOWER, 1-1/4 IN DIA	13Z159D3	1
22	SPACER	18H7671D1	1
23	PLAIN WASHER, 3/4 IN	3611V012	1
24	JAM NUT, 3/4-16	2065V008	1
25	CAM FOLLOWER, 3/4 IN DIA	13Z159D3	2
26	SPACER	18H7671D4	2
27	JAM NUT, 7/16-20	2065V004	2
28 *	BALL BEARING, SEALED	25Z246D6	2
29	SPRING WASHER	18Z1852D3	1
30	ANGLE INSULATION	70H19D13	4
31	CLAMP	32F450	4
32	SPRING	17Z515	1
33	CAPSCREW, HEX HD, 1/2-13 X 1-1/4 IN	0826V078	2
	LOCKWASHER, 1/2 IN	3616V011	2
34	SCREW LOCK PLATE	18H7954	1

* - RECOMMENDED SPARE

TYPE DB-270 AC POWER LIMIT SWITCH-DUPLEX
(NOT EXACTLY AS SHOWN:)

ITEM		DESCRIPTION	PART NO.	QTY
35		SPRING SEAT	18H7784	1
36		SETSCREW, HEADLESS, SOC CUP POINT, 5/16-18 X 1 IN	0882V051	1
37		HEX NUT, 5/16-18	2145V002	1
38		LOCKWASHER, 5/16 IN	3643V010	1
39	*	FLANGE BUSHING	5Z130D18	2
40		PIN	19H3408	1
41		CAM LEVER (INCLUDES ITEM 39)	6E229-F1	1
42		SHAFT, WEIGHT ARM	10A40D1	1
43		KEY, 1/2 IN X 1/2 IN X 2-1/4 IN	20H2984D14	1
44		CAM FOLLOWER, 5/8 IN DIA	13Z159D3	2
45		LOCKWASHER, 5/16 IN	3643V010	2
46		HEX NUT, 5/16-24 UNF	2149V002	2
47	*	BALL BEARING, SEALED	25Z246D10	2
48		SEPARATOR, BEARING	25F2667D3	1
49		SHAFT, STATIONARY CONTACT	10E131D1	2
50		ANGLE INSULATION	70H19D15	8
51		CAPSCREW, HEX HD, 3/8-16 X 1 IN	20Q260D258	2
52		LOCKWASHER, 3/8 IN	3643V011	2
53		CABLE	79H1878D1	4
		SEAL, KNOCKOUT	87Z246D2	2
		MACH. SCREW, PAN HD, 6-32 X 5/8 IN	0862V063	4
54		CAPSCREW, HEX HD, 3/8-16 X 1-1/4 IN	20Q260D260	4
55		PLAIN WASHER, 3/8 IN, HVY	3632V004	4
56		LOCKWASHER, 3/8 IN, EXTRA DUTY	3643V011	2
57		HEX NUT, 3/8-16	2145V003	2
58		CONNECTOR CLAMP	32F451	2
59		CAPSCREW, HEX HD, 3/8-16 X 1 IN	20Q260D258	2
		HEX NUT, 3/8-16	2145V003	2
60		PLAIN WASHER, 3/8 IN, HVY	3632V004	2
61		LOCKWASHER, 3/8 IN, EXTRA DUTY	3643V011	2
62		CONTACT STOP	79F3159	2
63		CAPSCREW, HEX HD, 5/16-18 X 1-1/4 IN	20Q260D228	8
64		LOCKWASHER, 5/16 IN, EXTRA DUTY	3643V010	8
65		CAPSCREW, HEX HD, 1/4-20 X 1 IN	0826V006	2
66		PLAIN WASHER, 1/4 IN, HVY	3632V002	2
67		LOCKWASHER, 1/4 IN, EXTRA DUTY	3643V009	2
		HEX NUT, 1/4-20	2145V001	2
68		HOUSING	14A1158D1	1
69		SAFETY CHAIN	20H3330F1	1
70		PIN	19H3332	2

* - RECOMMENDED SPARE

TYPE DB-270 AC POWER LIMIT SWITCH-DUPLEX
(NOT EXACTLY AS SHOWN:)

ITEM		DESCRIPTION	PART NO.	QTY
71		SPRING	17Z474	2
72		SHAFT CLAMP	32F456	2
73		CONTACT HOLDER	79E3090	2
74	*	CONTACT TIP	79H1876	2
75		CAPSCREW, HEX HD, 3/8-16 X 7/8 IN	0826V040	4
76		LOCKWASHER, 3/8 IN, EXTRA DUTY	3643V011	4
77		BEARING HOUSING	25E154	1
78		CAPSCREW, HEX HD, 3/8-16 X 7/8 IN	20Q260D257	3
79		LOCKWASHER, 3/8 IN, EXTRA DUTY	3643V011	3
80		CAPSCREW, HEX HD, 3/8-16 X 7/8 IN	20Q260D257	2
81		LOCKWASHER, 3/8 IN, EXTRA DUTY	3643V011	2
82		PLAIN WASHER, 3/8 IN, HVY	3632V004	2
83		GROMMET	20F57D59	4
84	*	ARC CHUTE	979E100-1	2
85		SPRING	17Z517	2
86		LATCH LEVER	6E225	2
87		SHAFT	10F9080D3	2
88	*	NEEDLE BEARING	25Z951D8	2
89	*	NEEDLE BEARING	25Z951D7	2
90		RETAINER RING	18Z2402D2	2
91		BEARING HOUSING	25E154	1
92		CAPSCREW, HEX HD, 3/8-16 X 7/8 IN	20Q260D257	4
93		LOCKWASHER, 3/8 IN, EXTRA DUTY	3643V011	4
94		RETAINER PLATE	18F1589D3	1
95		LOCKWASHER, 3/8 IN, EXTRA DUTY	3643V011	2
96		CAPSCREW, SPECIAL	20H3353D3	2
97		TERMINAL, SOLDERLESS	79F1376D91	4
98		NOT USED		
99		WEIGHT ARM	6A38	1

ITEMS 100 THRU 107 ARE NOT USED

* - RECOMMENDED SPARE

CABLE REEL MATERIAL
-NOT ILLUSTRATED-

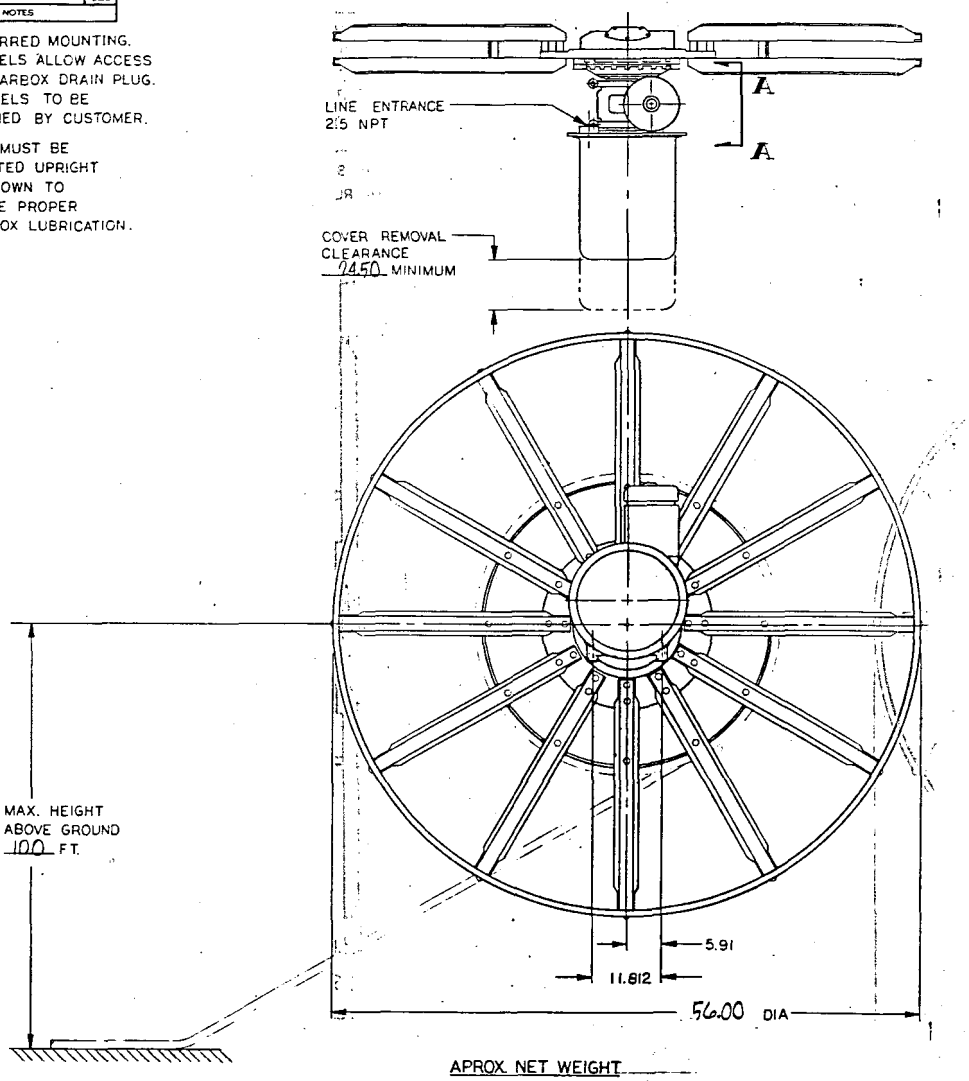
ITEM	DESCRIPTION	PART NO.	QTY
1	GLEASON TR SERIES MOTOR DRIVEN ELECTRIC.... CABLE REEL REEL TO LIGT 70' 20 COND. #10 TYPE SO CABLE AT A SPEED OF 90 F.P.M. REEL COMPLETE W/100' 20 COND. #10 TYPE SO CABLE & VERTICAL DOWN GUIDE ROLLER. CAT .#TR1-203 285B56-28022-J1 SEE GLEASON REEL MATERIAL FOLLOWING	------	1
2	HEATER ELEMENT FOR CABLE REEL	480Z5D39	3
3	CABLE REEL FUSES 10 AMP.....	79Z754D7	3

SHEET 1 OF 1

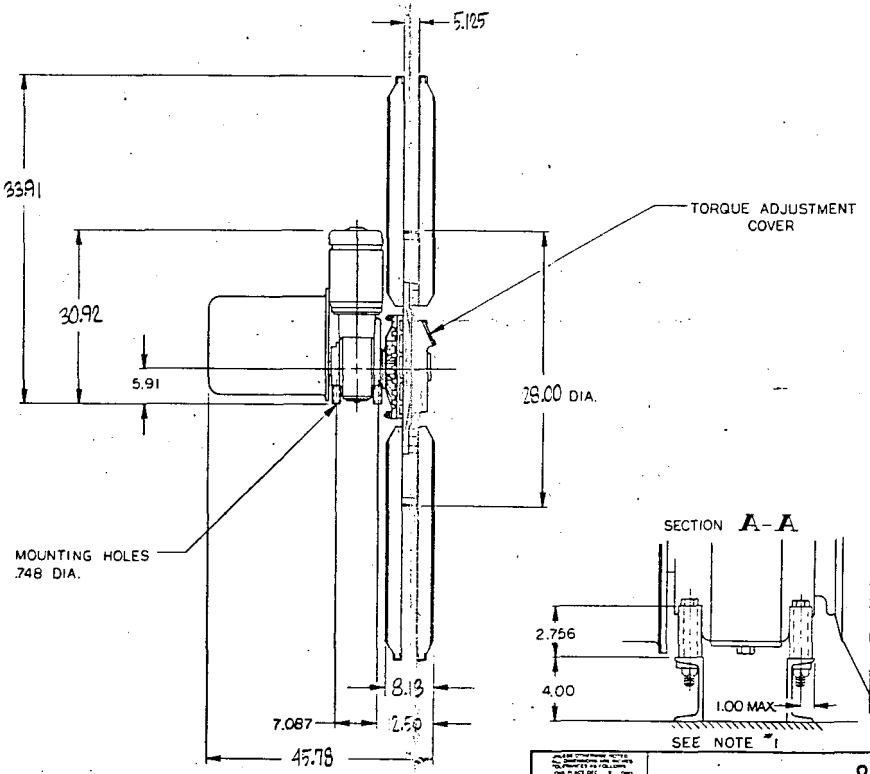
G997760 D SIZE

NOTES

1. PREFERRED MOUNTING. CHANNELS ALLOW ACCESS TO GEARBOX DRAIN PLUG. CHANNELS TO BE SUPPLIED BY CUSTOMER.
2. REEL MUST BE MOUNTED UPRIGHT AS SHOWN TO INSURE PROPER GEARBOX LUBRICATION.



CUSTOMER: HARNISCHFEGER CORP.
COLLECTOR: 20 POLES 35 AMPS 600 VOLTS
MOTOR: 2 H.P. 1200 R.P.M. 185% MINIMUM STARTING TORQUE
460 VOLT 3 PHASE 60 CYCLE 184TC FRAME
REEL TO LIFT 100 FT. OF 20/C #10 CABLE 1.54 DIA.
AT 90 F.P.M. WITH A LIFTING HEIGHT OF 100 FT. OR LESS.
ACCELERATION 1.0 FT/SEC/SEC
CUSTOMER REQUIREMENTS: CUSTOMER TO SUPPLY AC MOTOR STARTER WITH THERMAL OVERLOAD RELAYS.



SECTION A-A

APROX. NET WEIGHT

WITH CABLE OR HOSE 751.0 LBS.

WITHOUT CABLE OR HOSE 562.0 LBS.

ITEMS INCLUDED WITH REEL:

- [x] CABLE
- [ ] MOTOR CONTROL PACKAGE
- [ ] PAYOUT SENSOR (REQUIRED FOR TWO-WAY PAYOUT APPLICATIONS)
- [x] LIMIT SWITCH (SENSES MAXIMUM CABLE PAYOUT)
- [x] ROLLER OUTLET ASS'M SM28V P/N 015992

REVISIONS				HOLE LIST		
LET	DESCRIPTION	DATE BY	SYM	SIZE	QTY	
A	RELEASE IDEN					

Gleason Reel

GLEASON REEL
MAYVILLE, WISCONSIN
CABLE & HOSE REELS - POWERTRAK - FESTOON

APPLICATION	
NEXT ASSY	SIM TO

TRI-203-285B76-28022-J1

CABLE REEL

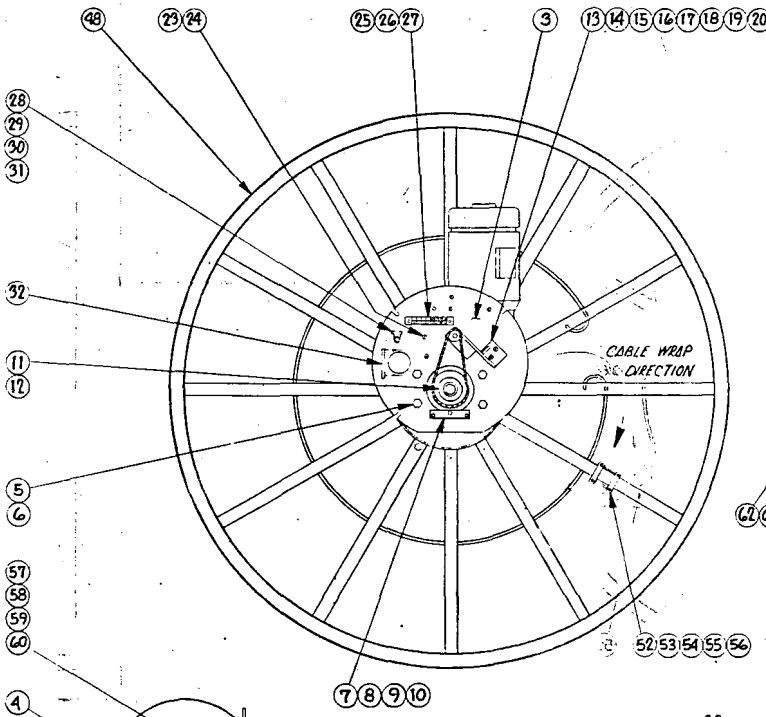
DRAWN DLC 1-13-88 DATE
CHKD BY DATE
DO NOT SCALE DRAWING
SIZE D
G997760
SCALE NTS
SHEET 1 OF 1

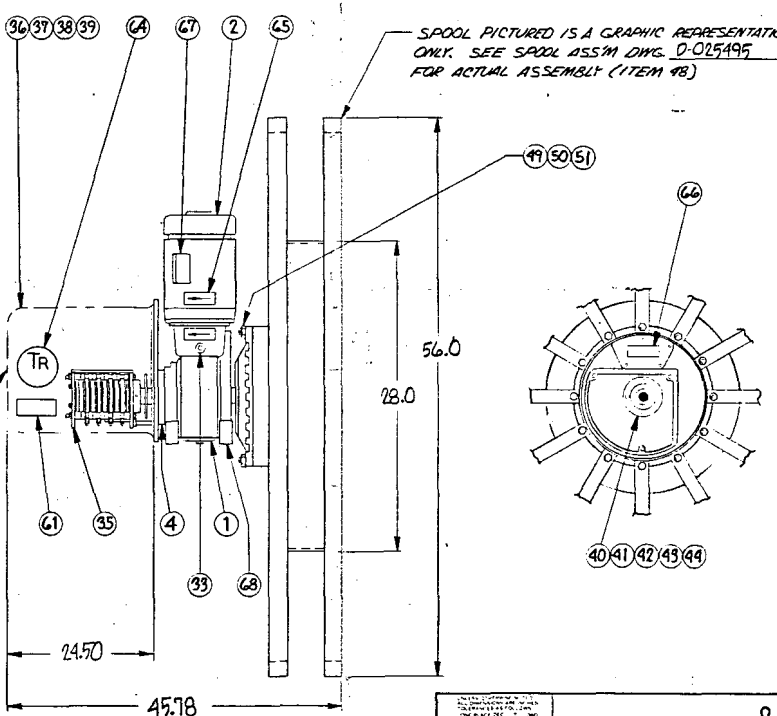
BILL OF MATERIAL

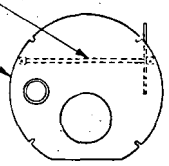
IT	QTY	PART NO.	DESCRIPTION
1	1	C-SCS1	TR CLUTCH UNIT
2	1	C-016556C4	TR DRIVE PACKAGE
3	1	D-018566	BACK PLATE ASS'M
4	1	B-018769	SPACER PLATE
5	4	A-010898	HEX METRIC BOLT M16
6	4	101909	LOCKWASHER .62
7	1	B-018574	COLLECTOR DRIVE ASS'M
8	2	G60-11	SPACER BUSHING
9	2	101390	HX HD CS .31-18 x 2.75 LONG
10	2	101091	LOCKWASHER .31
11	1	B-018571	SHAFT
12	2	105806	ROLL PIN .188 x 2.00 LONG
13	1	A-023385	LIMIT SWITCH
14	1	C-023390	MTG. BRACKET ASS'M
15	1	A-179081	SPROCKET 25 PITCH 20 TOOTH
16	1	A-101474	CHAIN #25
17	2	A-101281	HX HD CS .25-20 x .625 LONG
18	2	A-101090	LOCKWASHER .25
19	4	A-101261	RD HD MS #10-24 x .625
20	4	A-101088	LOCKWASHER #10
21	2	A-101206	FLATWASHER .25
22	1	A-700354	CONNECTOR LINK #25 CHAIN
23	6	A-101019	RD HD MS #10-32 x 3/8 LONG
24	6	A-101088	LOCKWASHER #10
25	1	G-12-13	TERMINAL BLOCK 8 POLE
26	2	101244	RD HD MS #10-32 x .750 LONG
27	2	101088	LOCKWASHER #10
28	1	A-11365602	CONNECTOR - FLEX CONDUIT
29	1	A-11345702	CONNECTOR 90° FLEX CONDUIT
30	2 FT	A-11379002	CONDUIT - FLEXIBLE
31	1	A-01850202	SEALING O' RING
32	1	A-119485	90° STREET ELBOW
33	1	A-016005	PLUG COUNTERSUNK
34	20 FT	B-11746909	#14 GA. LEADWIRE
35	1	D-012294	COLLECTOR ASS'M
36	1	D-01863703	COLLECTOR COVER ASS'M
37	4	B-018693	'J' BOLT
38	4	101263	LOCKNUT .25-20
39	4	101206	FLATWASHER .25
40	1	C-012011	ADAPTOR PLATE
41	4	018970	HX HD CS M10-1.5
42	4	018971	LOCKWASHER M10
43	1	—	REDUCING BUSHING
44	1	A-104821	CABLE CONNECTOR
45	1	—	JUNCTION BOX ENTRANCE
46	1	—	JUNCTION BOX COVER
47	1	—	CORD RING
48	1	D-025495	SPOOL ASS'M
49	12	01866101	HX HD CS 1/2-13 x 5.50 LONG
50	12	100959	HEX NUT 1/2-13
51	12	101389	LOCKWASHER 1/2
52	1	C-015347	CABLE CLAMP BODY
53	2	C-01022105	U-BOLT
54	1	B-02415405	PLATE - CABLE CLAMP
55	4	101263	LOCKNUT .25-20
56	4	101206	FLATWASHER .25
57	2	A-016510	CLAMP TR WRENCH
58	1	016866	ADJUSTMENT WRENCH
59	2	A-101282	HX HD CS .25-20 x .88 LONG
60	2	101090	LOCKWASHER .25
61	1	G79-04	NAMEPLATE
62	1	B-019992	DECAL - CAUTION # 1
63	1	B-019993	DECAL - CAUTION # 2
64	2	B-015115	DECAL "TR"
65	2	A-11006	ROTATION STICKER
66	1	B-014699	TR TORQUE CAUTION TAG
67	1	B-014271	CAUTION TAG
68	1	B-015233	CAUTION TAG - LUBE
69	1	017451	MAINTENANCE + OPERATING INST.
70	1	103130	PLASTIC BAG
71	1	02499303	SHIPPING FRAME

NOTES

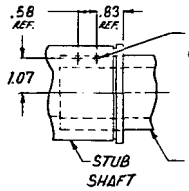
1. LOCATE, DRILL & TAP FOR .50 NPTF CKS PLUG ITEM # 33
2. TORQUE SETTING: 7/16 LBS MEASURED AT WRAPPER
3. COLLECTOR ENCLOSURE TO BE WIRED PER DRAWING # G999760-1
4. LOCATE SHAFT, ITEM # 11 ON TR UNIT, ITEM # 1. DRILL (2) .188 HOLES THRU FOR ITEM # 12
5. DIELECTRIC TEST- APPLY FOR 1 MINUTE AT 60 HZ SINUSOIDAL POTENTIAL OF 2200 VOLTS. BREAKDOWN MUST NOT OCCUR.
6. CLEAN AND PAINT WITH P/N 104924
7. PLACE ONE DECAL, ITEM # 69 ON EACH SIDE OF COLLECTOR COVER.
8. PLACE ITEM # 69 INSIDE ITEM # 70 AND ATTACH TO COLLECTOR ASS'M ITEM # 35
9. INSTALL BACKSTOP CLUTCH AND DRIVE COUPLING BETWEEN MOTOR AND TR UNIT. CHECK FOR PROPER ROTATION.







TR ADJUSTMENT WRENCH MOUNTING



REVISIONS					
LET	DESCRIPTION	DATE	BY	SIZE	QTY
A	RELEASE ECN				

HOLE LIST

THIS DRAWING AND ALL INFORMATION THEREON IS THE SOLE PROPERTY OF GLEASON REEL, IT MUST NOT BECOME RE-PRODUCED OR SUBMITTED TO OTHERS WITHOUT WRITTEN PERMISSION AND MUST BE RETURNED ON DEMAND.

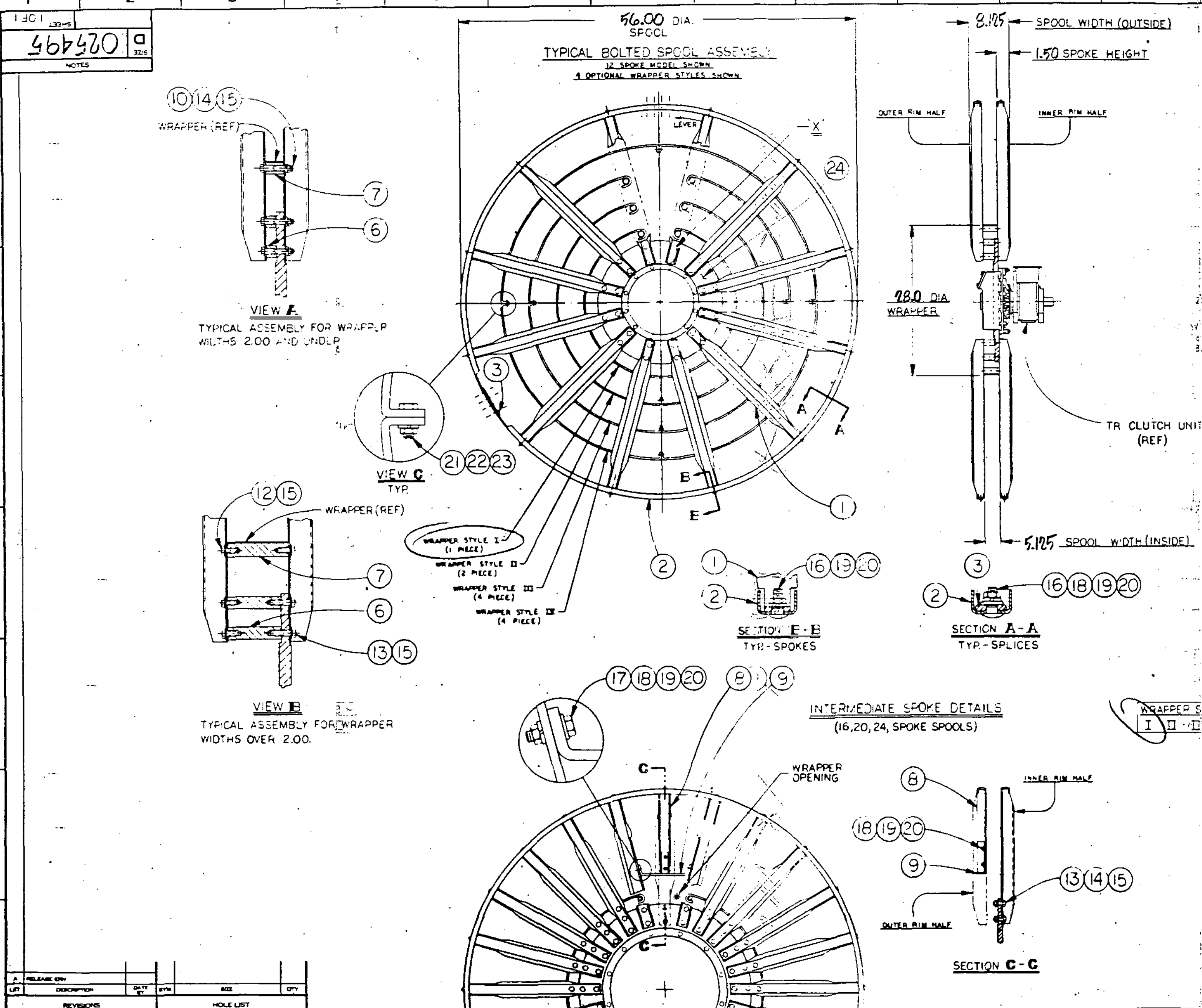
Gleason Reel

GLEASON REEL
MAYVILLE, WISCONSIN
CABLE & HOSE REELS · POWERTRAK · FESTOON

APPLICATION	
NEXT ASSY	SIM TO

TRI-203-1B5B56-28022-J1
CABLE REEL
WITH ROTARY LIMIT SWITCH

DRAWN DLL 4-7-88 DATE
CHKD BY DATE
DO NOT SCALE DRAWING
SCALE
SIZE D 025430
SHEET 1 OF 1



SPOOL ASSEMBLY

1. ASSEMBLE SPOKES AND WRAPPER

   A. FOR WRAPPER WIDTHS 2.00" AND UNDER:

   For single piece wrappers, bolt 2 opposing spokes onto the hub using the correct spacers and hardware as shown in View A. Do not tighten. Hang the curled end of the wrapper from the spacer. Continue along the hub, bolting together opposing spokes, while sandwiching the wrapper in between the spokes. Do not tighten. For multiple piece wrappers, bolt all of the spokes onto the hub using the correct spacers and hardware as shown in View A. Do not tighten. Position each wrapper segment in place. Bolt the segments together using hardware as shown in View C. If necessary, remove the bolt and spacer labeled 'X' and use that spoke as a lever to pull the wrapper into position. Then replace the bolt and spacer.

   B. FOR WRAPPER WIDTHS OVER 2.00":

   Assemble only the inner rim half spokes to the hub, using the threaded spacers and hardware as shown in View B. Do not tighten. Place the wrapper over the exposed end of the spacers. Use this method for single or multiple piece wrappers. Bolt the multiple piece wrapper together over the spacers using hardware as shown in View C. If necessary, remove the bolt and spacer labeled 'X' and use that spoke as a lever to pull the wrapper into position. Then replace the bolt and spacer. Bolt the outer rim half spokes in place as shown.

   If this spool has an intermediate spoke (16, 20, 24 spoke spools), one spoke should be left out in the outer half of the spool. Bolt the intermediate spoke in place of the missing spoke. The wrapper opening should be positioned opposite the intermediate spoke. Use the hardware as shown in Intermediate Spoke Details and Section C-C. Do not tighten

   *Note: When using wrapper Style No. IV, two of the spacers are already welded to the wrapper.

2. ASSEMBLE RIMS

   Fasten rims to the spokes using hardware as shown in Section B-B. Do not tighten. Fasten splice plates to the rims using hardware as shown in Section A-A. Do not tighten.

3. TIGHTEN ALL BOLTS IN THE FOLLOWING ORDER:

   Rim and spoke bolts, rim and splice bolts (space rims apart evenly), wrapper bolts, and finally, rim and hub bolts. Take care at the rim splices and spoke attachments to insure that no sharp edges protrude into the cable compartment.

ITEM	QTY	PART NO	DESCRIPTION
24	1	D-024255	SPOOL ADAPTER HUB
23	—	100942	HEX NUT .25-20
22	—	101090	LOCKWASHER .25
21	—	101048	HHCS .25-20 X .75 L
20	48	100949	HEX NUT 5/16-18
19	48	101091	LOCKWASHER-SPLIT 5/16
18	32	017431	FLATWASHER 5/16
17	—	101075	HHCS 5/16-18 X 1.00 L
16	48	104399	CARRIAGE BOLT .31-18 X .75 L
15	48	101389	LOCKWASHER-SPLIT 1/2"
14	—	100959	HEX NUT 1/2-13
13	16	101396	HHCS 1/2-13 X 1.50 L
12	32	101393	HHCS 1/2-13 X .75 L
11	—	—	HHCS 1/2-13 X L
10	—	—	HHCS 1/2-13 X L
9	—	—	INTERMEDIATE SPOKE BRKT.
8	—	—	INTERMEDIATE SPOKE
7	8	B-025498	SPACER-LONG 5.125 L
6	16	B-025497	SPACER-SHORT 4.685 L
5	—	—	WRAPPER W X O.D.
4	1	D-025496	WRAPPER 5.06W X 28.0 O.D.
3	8	024253	SPLICE PLATE
2	8	D-025106	RIM
1	6	D-025105	SPOKE 18.55 L X 1.50 H

BILL OF MATERIAL

WRAPPER STYLE: I II III IV

Gleason Reel
GLEASON REEL
MAYVILLE WISCONSIN
CABLE & HOSE REELS · POWERTRAK · FESTOON

APPLICATION | NEXT ASSY | SIM TO

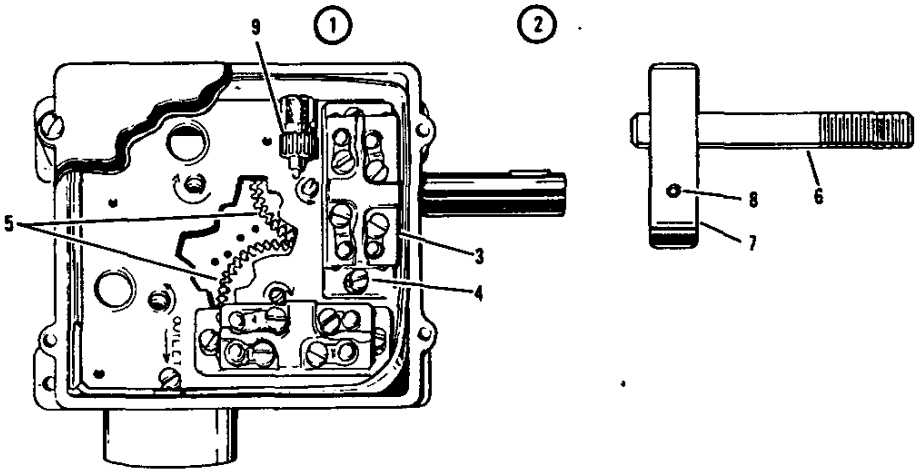
BOLTED SPOOL
DIRECT TR REEL
56.0 O.D. x 5.125 WIDE

DO NOT SCALE DRAWING | SIZE D | 025495
SCALE NTS | SHEET 1 OF 1
DATE 1-6-88

REVISIONS | HOLE LIST

D 025495 SHEET 1 OF 1 NOTES

ILLUSTRATION NO. CI-21
GEARED LIMIT SWITCH APPLICATION



DWG. NO. 100E5507

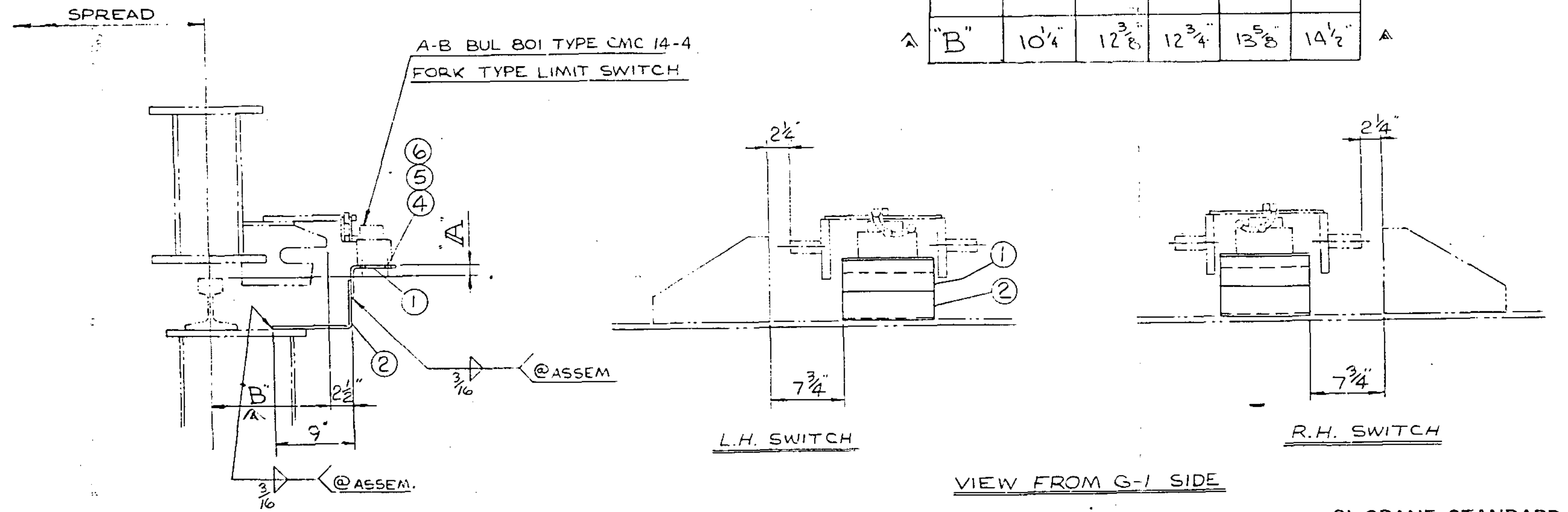
BILL OF MATERIAL

NO. REQUIRED	FIG	DESCRIPTION	MATERIAL P&H NO	PART NO	WGT.	SHT. NO. REF.	ITEM NO.
2		SUPPORT-LIMIT SWITCH		16H3987			1
2		SUPPORT-LIMIT SWITCH		16H3988			2
							3
8		5/16" x 1 1/2" HEX. BOLT		0626V025			4
8		5/16" HEX. NUT		2045V002			5
8		5/16" LOCK WASHER		3615V008			6

TROLLEY

2- 792601 - SEE A.B. BULL. 801-6.0

	9" ⌀ WHEEL	12" ⌀ WHEEL	15" ⌀ WHEEL	18" ⌀ WHEEL	21" ⌀ WHEEL
	T1 6 & 7 10 + 11	T1 10 & 13 20 + 21	T1 33 30 + 31	T1 43 40 & 41	T1 53 50 & 51
"A" =	9/16"	1 5/16"	1 3/16"	5/16"	5/16"
"B"	10 1/4"	12 3/8"	12 3/4"	13 5/8"	14 1/2"



CI CRANE STANDARD

FULL SCALE

.02 GRAD. .05 GRAD. .10 GRAD.

GENERAL TOLERANCE NOTES		
DECIMAL PLACE	STRUCTURAL	MACHINING
(1) PLACE 0.0	± .240"	± .040"
(2) PLACE 0.00	± .120"	± .020"
(3) PLACE 0.000	± .060"	± .010"
(4) PLACE 0.0000	± .030"	± .005"

EXCEPTIONS:
(1) TOL. BELOW ± .005" TO BE SHOWN TO UPPER AND LOWER LIMIT.
(2) ∇ = INDICATES USE OF DECIMAL PLACE TOLERANCE OTHER THAN INDICATED BY ORIGINAL DECIMAL DIMENSION.
AS. 0.125" — (USE ONE DECIMAL PLACE TOL.)

CHANGE MARK	CHANGE	NAME & DATE
A	ADDED WHEEL ⌀ REF. ADDED DIM. FOR T1-30,31,43 ADDED DIM. FOR T1-50,51,53 ADDED "B" DIM. TO CHART @ D-11.	S.C.J. 1-18-82

PART NO | HEAT TREATMENT OR PROCESSING SPECIFICATIONS
SURFACE ROUGHNESS NOTE | ESTIMATED WEIGHTS RGH. FIN.
SURFACE MARKED THUS V MUST BE WITHIN A ROUGHNESS VALUE OF 250 MICROINCHES UNLESS OTHERWISE SPECIFIED

SCALE 1 1/2" = 1'-0" | DATE 6-27-75
DR. BY RRL | SIMILAR TO | BASIC LIST NO.
CH. BY [illegible] | APP. BY EH | PROC. BY KMJ

Harnischfeger P&H

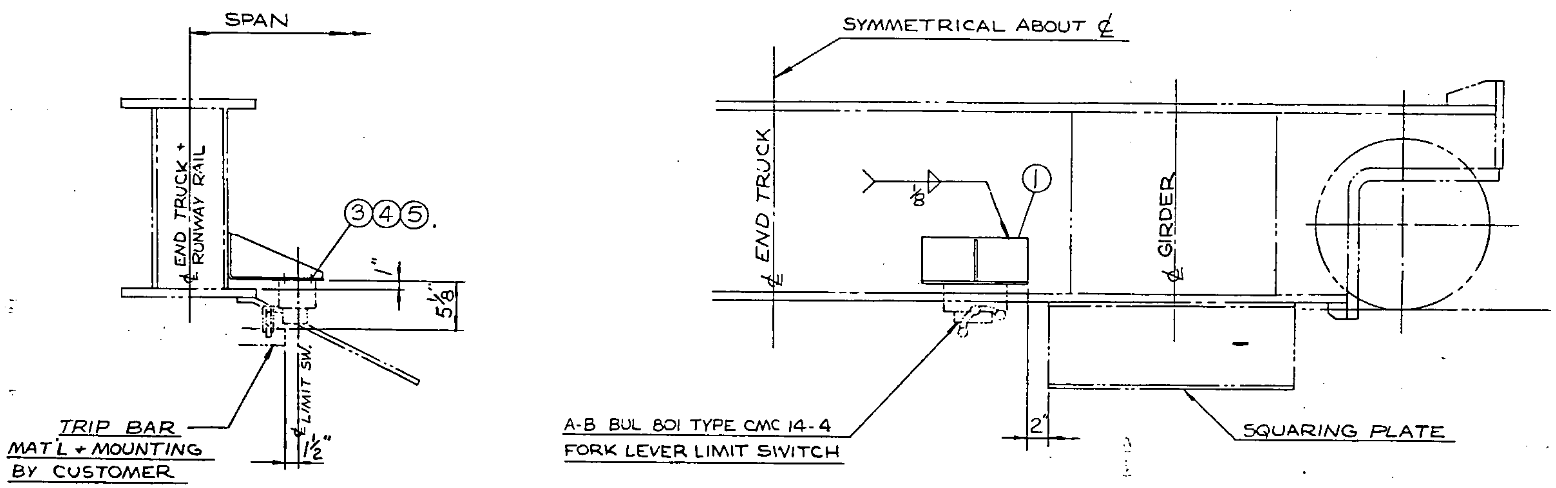
TITLE TRACK LIMIT SW. APPLICATION
PROD. OR MODEL CI CRANES
DWG. NO. 100E5507

DWG. NO. 100E5508

BILL OF MATERIAL

NO. REQUIRED	DESCRIPTION	MATERIAL P&H NO.	PART NO. SEMI-FIN. PART NO.	UNIT WGT. RGH.	UNIT WGT. FIN.	SHT. NO. REF.	ITEM NO.
2	SUPPORT		16F5187				1
							2
8	5/16" x 1 1/2" HEX. BOLT		0626V025				3
8	5/16" HEX. NUT		2045V002				4
8	5/16" LOCKWASHER		3615V008				5
							6
							7

BRIDGE
2- 79Z601- SEE A.B. Bull. 801-6.0



CI CRANE STANDARD

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FULL SCALE

GENERAL TOLERANCE NOTES

DECIMAL PLACE		STRUCTURAL	MACHINING
(1) PLACE	0.0	± .240"	± .040"
(2) PLACE	0.00	± .120"	± .020"
(3) PLACE	0.000	± .060"	± .010"
(4) PLACE	0.0000	± .030"	± .005"

EXCEPTIONS:
1. TOL. BELOW ± .005" TO BE SHOWN TO UPPER AND LOWER LIMIT.
2. ∇ = INDICATED USE OF DECIMAL PLACE TOLERANCE OTHER THAN INDICATED BY ORIGINAL DECIMAL DIMENSION.
AS: 0.125" — (USE ONE DECIMAL PLACE TOL.)

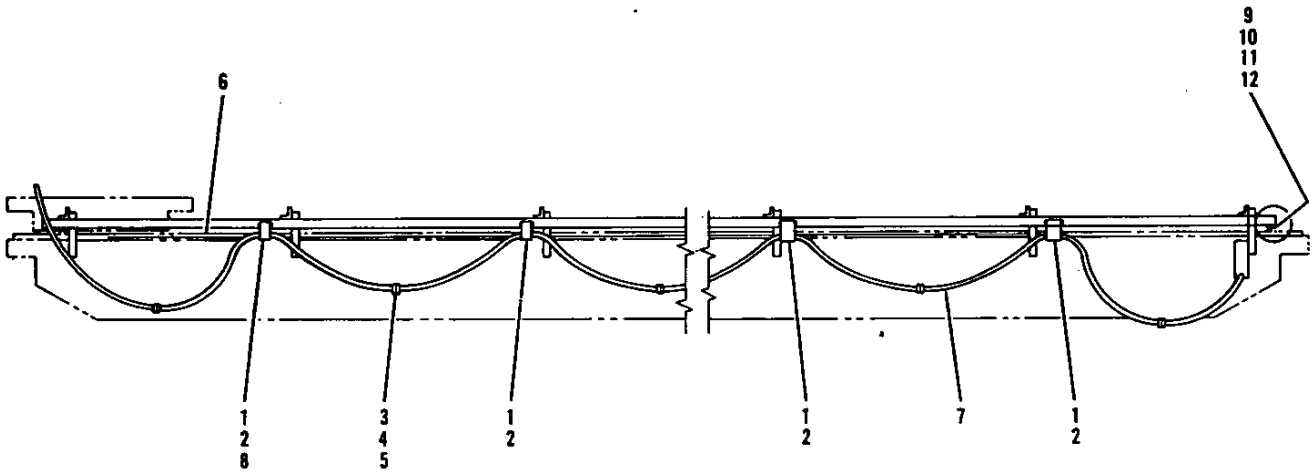
SURFACE MARKED THUS ∇ MUST BE WITHIN A ROUGHNESS VALUE OF 250 MICROINCHES UNLESS OTHERWISE SPECIFIED

SCALE: 1 1/2"=1'-0" | DATE: 7-15-74 | DR. BY: RRL | CK. BY | APP. BY: EHH | PROC. BY: KMJ

Harnischfeger P&H

TITLE: TRACK LIMIT SWITCH APPL.
PROD. OR MODEL: CI - CRANES
DWG. NO. 100E5508

ILLUSTRATION NO. CI-22
FESTOON CONDUCTOR SYSTEM

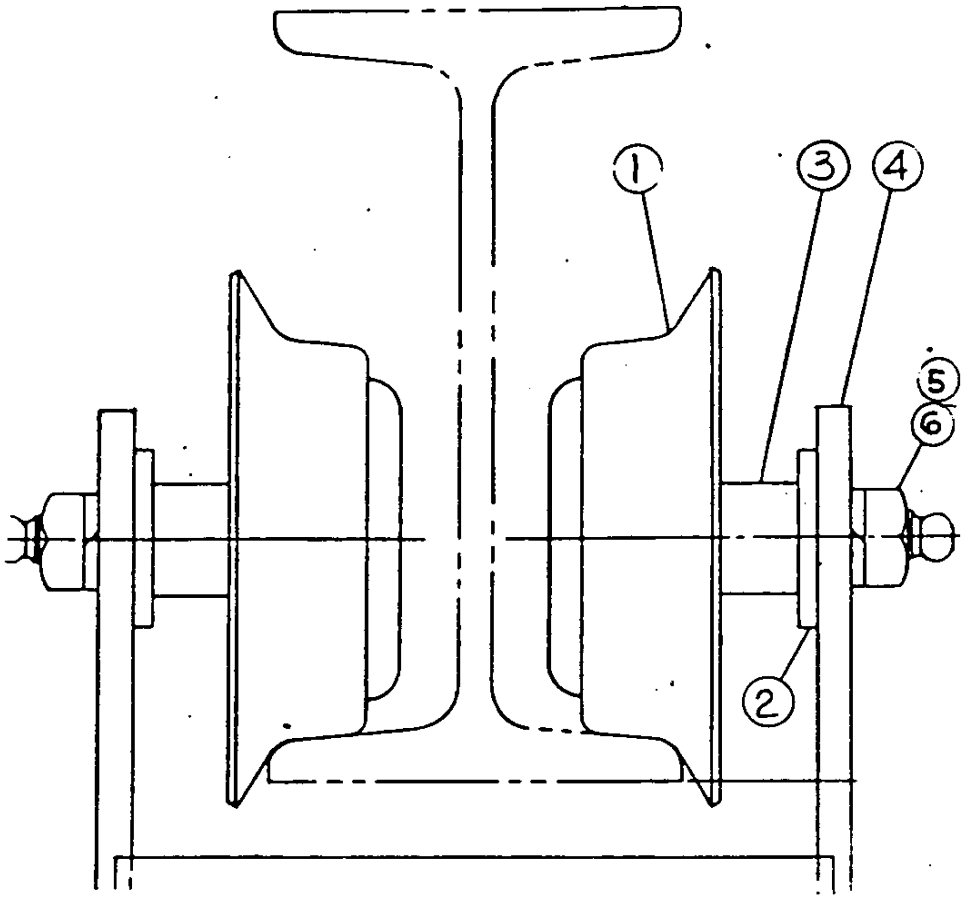


Hamischfeger
P&H

FESTOON CONDUCTOR SYSTEM
29A8589F1

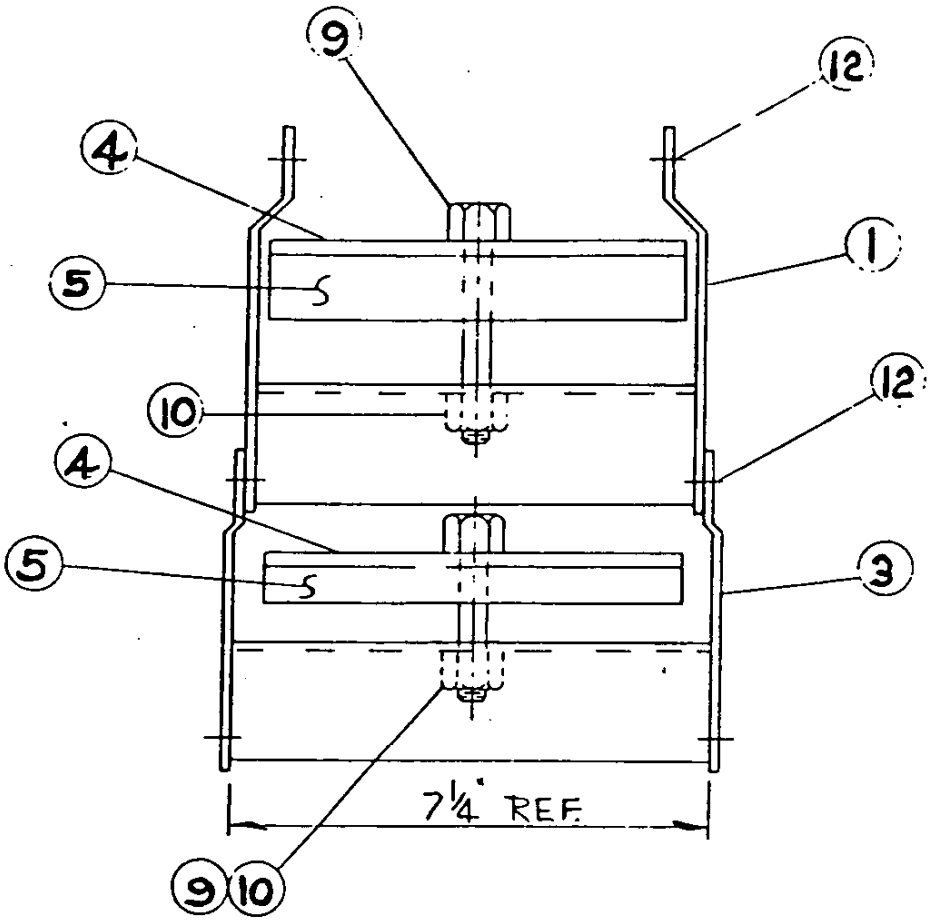
ITEM	DESCRIPTION	PART NO.	QTY
1	TROLLEY ASSEMBLY (INCLUDES ITEM 1A) ..... SEE DWG. FOLLOWING FOR DETAILS	929E6-3	8
2	CABLE HANGER ..... SEE DWG. FOLLOWING FOR DETAILS	929A13F3	8
3	CABLE SPACER	29F5367D2	18
	CABLE SPACER	29F5367D1	18
4	CAPSCREW, HEX HD, 1/2 X 1/2"	20Q260D332	9
5	STOP NUT, SELF-LOCKING, 1/2"	20H1614D6	9
6	CHAIN, NO.2 MACH (136LIN. FT)	------	1
7	CONDUCTOR CABLE (92LIN. FT) ..... SEE XX-7 FOLLOWING	------	16
8	SWIVEL HANGER ASSY ..... SEE DWG. FOLLOWING FOR DETAILS	929E8-1	1
9	STOP ASSEMBLY	100H484F1	1
10	NOT USED		
11	NOT USED		
12	NOT USED		
	S HOOK NOT SHOWN	8Z19D7	34

TROLLEY ASSEMBLY – 929E6-3



ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY.
1	NOT USED		
2	WASHER	3612V006	4
3	NOT USED		
4	TROLLEY FRAME	29E5623	1
5	LOCKWASHER	3615V011	4
6	HEX JAM NUT 1/2"-13	2061V005	4
7	TROLLEY WHEEL	13Z121	4
8	SPACER	18H8042-D3	4

IMPORTANT: To expedite your repair parts order always indicate the Part Number, Part Description and the Crane Serial Number on each order.

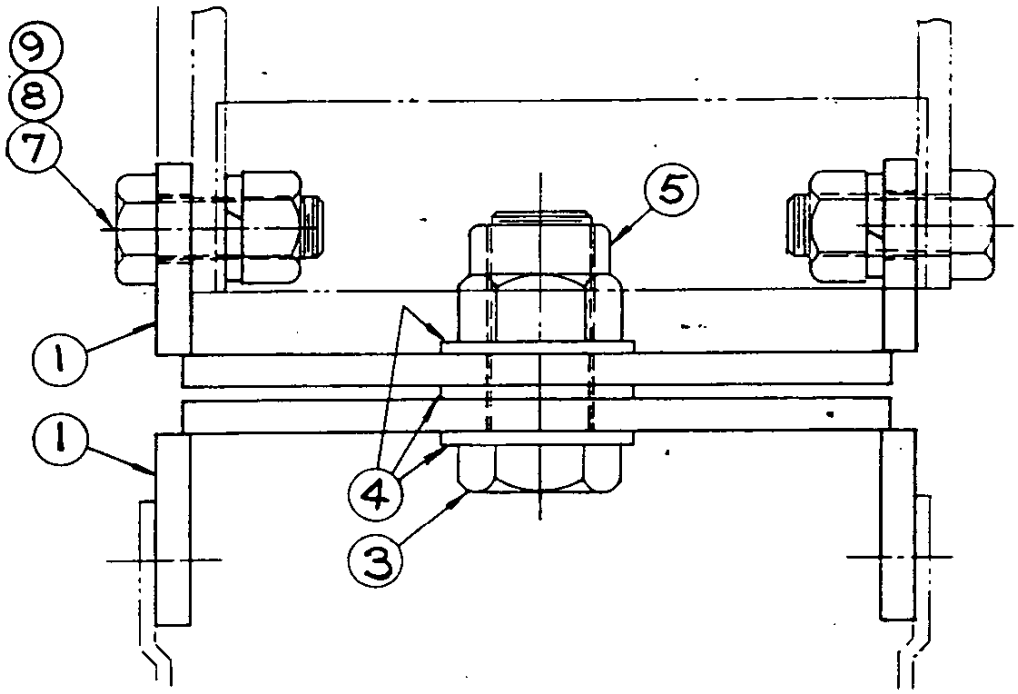


CABLE HANGER ASSEMBLY – 929A13-3

1	1–CABLE HANGER	29E6959
2	NOT USED	
3	1–CABLE HANGER	29E6960
4	2–CABLE CLAMPS	32H747
5	2–RUBBER STRAPS	16Z682
	ITEMS 6 THRU 8 NOT USED	
9	2–HEX. HD. M.B. 1/2" X 2-1/4"	------
10	2– HVY. SELF LOCK NUT 1/2"	------
11	NOT USED	
12	8–HEX. HD. MACH BOLT W/ HEX. NUT & LW 1/2" X 1"	------

FESTOON CONDUCTOR CABLES
-NOT ILLUSTRATED-

ITEM	DESCRIPTION	PART NO.	QTY
1	#12-8 COND. TYPE P&H 2042 CABLE .23-1.3"DIA		
2	#10-4 COND. TYPE P&H 2042 CABLE .27-.88"DIA		
3	#4-0-1 COND. TYPE P&H 0233 CABLE .93" DIA.. FOR MAIN HOIST MOTOR PRIMARY		
4	#250-1 COND. TYPE P&H 0233 CABLE 1.03" DIA. FOR MAIN HOIST MOTOR SECONDARY PRAMARY		
5	#4-0-1 COND. TYPE LP&H 0233 CABLE .93" DIA. FOR MAIN HOIST MOTOR DB LIMIT SWITCH		
6	#2-0-1 COND. TYPE P&H 0233 CABLE .84" DIA.. FOR GRAPPLE MOTOR		
7	#148 COND. TYPE P&H 2042 CABLE .21-1.2"DIA,		
8	CORD GRIPS FOR ITEM 1.....	79Z4056D5	2
9	CORD GRIPS FOR ITEM 3.....	85Z24D13	6
10	CORD GRIPS FOR ITEM 4.....	85Z24D14	6
11	CORD GRIPS FOR ITEM 5.....	85Z24D13	4
12	CORD GRIPS FOR ITEM 6.....	85Z24D13	6

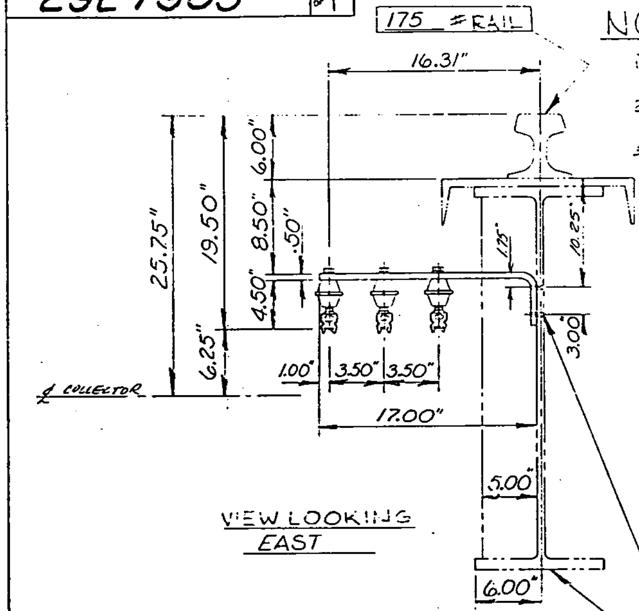


SWIVEL HANGER ASSEMBLY – 929E8-F1

CONSISTS OF THE FOLLOWING:

1	2 – SWIVEL HANGERS – 29F4266
2	NOT USED
3	1 – HEX. HEAD CAP SCREW, 3/4"-10 X 2" LG, – 0626V132
4	3 – PLAIN WASHERS, 3/4"- 3611V012
5	1 – LOCKNUT (ESNA), 3/4"-10 – 20H1614-D8
6	NOT USED
7	4 – CAP SCREWS, 1/2"-13 X 1-1/4" LG. – 0626V078
8	4 – LOCKWASHERS, 1/2"-3615V011
9	4 – HEX NUTS, 1/2"-13 – 2045V005

29E7905 SH 1 OF 1



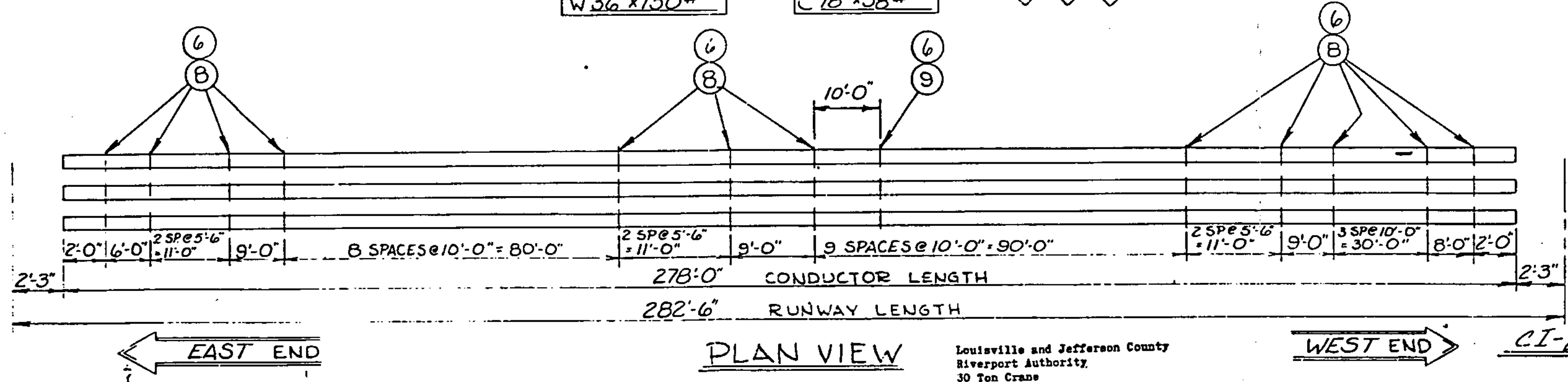
NOTES:

1) CONDUCTORS TO BE MOUNTED ON SOUTH RUNWAY.
2) POWER FEED ITEM 4, TO BE USED AS SPLICE JOINT.
3) SHORT LENGTH CONDUCTOR ITEM 2, TO BE AT WEST END

BILL OF MATERIAL

NO REQ	DESCRIPTION	MATERIAL NO P&H	PART NO (PN) SEMI-FNSH(PN)	UNIT WT RGH	UNIT WT FNSH	REF SH	IT NO
39	20'-0" SECTION SAF-T-BAR "H" CONDUCTOR BAR 750 AMPS		HA-750				1
3	18'-0" SECTION SAF-T-BAR "H" CONDUCTOR BAR 750 AMPS						2
							3
3	POWER FEED		HA-750F				4
6	END CAP		HA-750N				5
32	SUPPORT BRACKET		G-11-13-81				6
							7
93	HANGER CLAMP		HA-1000K				8
3	ANCHOR CLAMP		HA-1000KA				9
64	1/2"-13×2.50" HEX HD CAP SCR		INCLUDED WITH ITEM 6.				10
64	1/2"-13 HEX NUT						11
64	1/2" LOCKWASHER						12

SEE SAF-T-BAR Material Following



PLAN VIEW

Louisville and Jefferson County
Riverport Authority
30 Ton Crane
Crane No. CI-29638

CI-29638

PURCH REQ 221926

ALL DIMENSIONS ARE IN DECIMAL INCH (UNLESS OTHERWISE NOTED)

SURFACE MARKED THUS √ MUST BE WITHIN A ROUGHNESS VALUE OF 250 MICROINCHES UNLESS OTHERWISE SPECIFIED

GENERAL TOLERANCE NOTES		
DECIMAL PLACE	STRUCTURAL	MACHINING
(1) X.X	±.240	±.040
(2) X.XX	±.120	±.020
(3) X.XXX	±.060	±.010
(4) X.XXXX	±.030	±.005

EXCEPTIONS:
1. DIM. WITH TOL. UNDER ± .005 TO BE SHOWN AS NOM. DIM. ± TOL. E.G. 2.000 ± .002
2. USE ▽ TO INDICATE DECIMAL PLACE TOLERANCE OTHER THAN IMPLIED BY ORIGINAL DECIMAL DIMENSION. E.G. 0.125 = ONE PLACE TOL.

DWG BY SES DATE 12-8-87 — SCALE 1/2"=1'-0" — RELEASE DATE 12-22-87 — CHKD 12-8-87 — CH ENGR DATE 12-22-87 — PRES BY DATE 1-4-88

SIMILAR TO 32E3510

Harnischfeger P&H

TITLE: MAINLINE CONDUCTOR SYS. 30 TON OUTDOOR TW-21 BRIDGE

DWG NO 29E7905 SH 1 OF 1

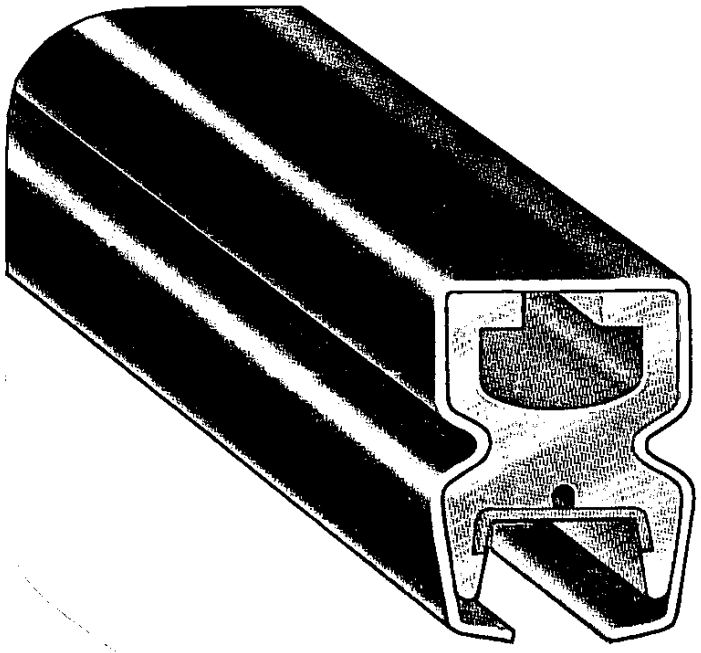
HOWELL

SAF-T-BAR

Electrification Systems

Series H

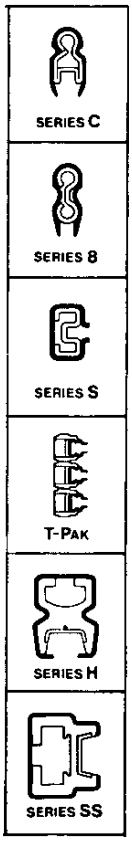
500 to 1500 amperes



Insulated Conductor Rail

For heavy duty cranes and monorails and port authority equipment

For people mover equipment, Howell makes a special series of rail (SS-1001).



SAF-T-BAR FEATURES

1. **METAL GUIDEWAYS** assure positive tracking of collector shoe. Collector tracks with or without insulating cover.
2. **FLAT CONTACT SURFACE** for long conductor wear, a stainless steel channel insert providing corrosion resistance and resistance to electrical pitting.
3. **CONTACT SHOE** with flat contact surface of sintered copper and graphite, self lubricating for effective draw of current to the collector.
4. **SKIN TIGHT INSULATION** runs cooler, will not deform under clamp pressure. Standard insulation is 160°F. Alternate insulations to 260°F, 375°F and 450°F are available.
5. **COMPACT MOUNTING** of conductor in vertical or horizontal position without special parts or fittings.
6. **COLLECTORS** are available in either single or dual head contruction.

The advanced Saf-T-Bar system reflects the basic engineering concept of an integral insulated conductor which provides years of safe, economical trouble-free service. It is designed for compact, low cost installation and minimum maintenance.

The Series H conductor can be mounted in any plane. In wet atmospheres the system should be mounted on spool insulators with the conductor in the downturn position. In dirty and dusty atmospheres mount the conductor in the downturn position. If the atmosphere is likely to cause electrical oversurface tracking, choose the spool type hanger clamps rather than the standard coated hanger clamp. A lexan slide-on insulating hanger is available to replace coated or spool type hangers. Conductors are supported on brackets on 10 ft. centers for all crane conductor positions.

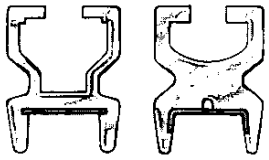
Series H conductors are supplied in 20 ft. lengths assembled complete with insulating covers. Other lengths are available. Joint fittings and covers are to be ordered separately.

HOWELL CORPORATION 1180 Stratford Road, Stratford, Connecticut 06497

Series H

SAF-T-BAR CONDUCTORS

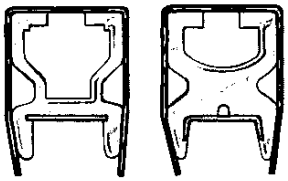
Bare Conductor Rail



HB-500-1
HB-750

HB-1000

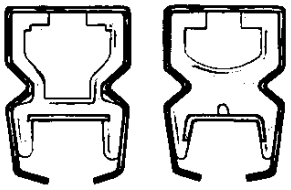
Insulated High Heat Conductor Rail



HC-500-1
HC-750

HC-1000

Insulated Conductor Rail

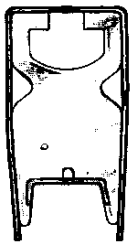


HA-500-1 (FI) (H,
HA-750 (FI) (H)

HA-1000 (FI) (H)

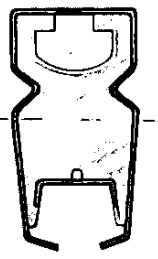
HB-1500

Bare Conductor Rail



HC-1500

Insulated High Heat Conductor Rail



HA-1500I (H)

Insulated Conductor Rail

Conductor Cat. No.	Amperage Service	Splice Joint	Power Feed	Hanger Assemblies For All Conductors	Expansion Gap Kit	End Cap
HA-500-1	500	HA-500J	HA-500F	Standard HA-1000H	HA-500XG-8"	HA-500N
HA-750	750	HA-750J	HA-750F	Insulator HA-1000K	HA-750XG-8"	HA-750N
HA-1000	1000	HA-1000J	HA-1000F	Lexan HA-1000P	HA-1000XG-8"	HA-1000N
HA-1500	1500	HA-1500J	HA-1500F		HA-1500XG-8"	HA-1500N

*Standard spool type hanger clamp assembly. $2\frac{13}{16}$" creep with $2\frac{1}{2}$" height.

Note: Refer to parts list for catalogue variations.

		Hanger
A Standard rigid vinyl cover.	For cranes and hoists.	As above.
H Medium heat cover (Lexan).	To 260°F, for cranes and hoists.	As above.
FI High Heat Fiber Glass Cover	To 375°F for cranes and hoists.	As above. Except HA-1000P
B Bare rail.	For extreme heat, cranes and hoists.	HB-1000QH
C High heat silicone cover.	To 450°F, for cranes and hoists.	HC-1000QH

Conductor Rail Characteristics	HA-500-1	HA-750*	HA-1000	HA-1500
Combined weight per foot	1.2	1.2	1.5	3.0 lbs.
Weight of aluminum per foot 6101-T6	.762 lbs.	.762 lbs.	1.13 lbs.	2.6 lbs.
Weight of 304 stainless steel per foot	.184 lbs.	.184 lbs.	.184 lbs.	.184 lbs.
Aluminum cross sectional area, sq. in.	.635	.635	.946	2.16
R—Resistance OHMS/Foot	.000023	.000023	.0000154	.0000066
Z—Impedance OHMS/Foot $3\frac{1}{2}$" c/c	.000046	.000046	.000042	.000034
Z—Impedance OHMS/Foot 5" c/c	.000053	.000053	.000048	.000041
Weight of vinyl cover/foot .060 thick	.16 lbs.	.16 lbs.	.16 lbs.	.25 lbs.
Rated 600V AC — UL Listed — Rated for crane use, rail and fittings. NEC Article 610				
* Was HA-650 - Direct Replacement.				
MCM	808	808	1,204	2,749

Voltage Drop Calculation

3 phase AC Volts lost = 1.73 x Z x Length in feet from feed x Ampere load
1 phase AC Volts lost = 2 x Z x Length in feet from feed x Ampere load
DC Volts lost = 2 x R x Length in feet from feed x Ampere load

As most motors are designed to operate with a 5% voltage drop, divide volts lost by line voltage to determine if a larger conductor or additional feed points are required. *See tables for values of Z and R.*

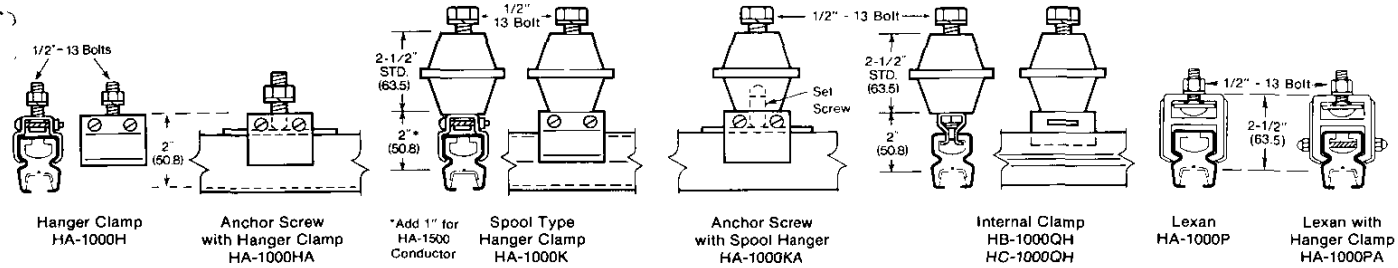
Determining Amperage — The national electric code suggests the following procedure when determining motor amperage loads:

1. For one motor, use 100% of motor nameplate full load ampere rating.
2. For multiple motors on a single crane or hoist, the minimum circuit ampacity of the power supply conductors on a crane or hoist shall be the nameplate full load ampere rating of the largest motor or group of motors for any single crane motion, plus 50% of the nameplate full load ampere rating of the next largest motor or group of motors.
3. For multiple cranes and/or hoists supplied by a common conductor system, compute the motor minimum ampacity for each crane as in step (2), add them together and multiply the sum by the demand factor from the following table:

Number of cranes	2	3	4	5	6	7
Demand factor	.95	.91	.87	.84	.81	.78

4. For constant loads such as magnets, lights, and air conditioners, etc., plus high duty cycles, use full load amperage, in selecting conductor size.

MOUNTING



Hanger Clamp HA-1000H | Anchor Screw with Hanger Clamp HA-1000HA | *Add 1" for HA-1500 Conductor | Spool Type Hanger Clamp HA-1000K | Anchor Screw with Spool Hanger HA-1000KA | Internal Clamp HB-1000QH *HC-1000QH* | Lexan HA-1000P | Lexan with Hanger Clamp HA-1000PA

Mounting. It is suggested that the hanger clamp bracket be attached to the runway beam by welding or bolting. Conductors should be spaced 5 inches apart, however a minimum of 3½ inches is acceptable. Hanger clamp brackets will require 9/16 inch holes for hanger clamp bolts of ½ inch. Conductor hanger clamps should be slid onto the rail and positioned relative to the approximate hanger clamp bracket, *so that when the rail is raised into* place, the hanger clamps may be bolted to their respective bracket. Hanger clamp cross bolts should be tightened so that the rail will slide easily, but will be securely supported. To properly support the conductor, and to keep standard rail overhang to 24 inches, space the first two brackets on 6 ft. centers, all other brackets on 10 ft. centers.

Lexan Hangers are a slide-on insulating hanger for use on PVC insulated series "H" conductors. They can be used in place of the coated or coated-plus-insulator series hangers. Anchor type Lexan hangers come with a drilled hole in the vertical stiffener on each side of the hanger. When the anchor and conductor are positioned as required a drill is run through the conductor bar, so that a threaded rod can be installed through the assembly, with each end protected by an insulating acorn nut.

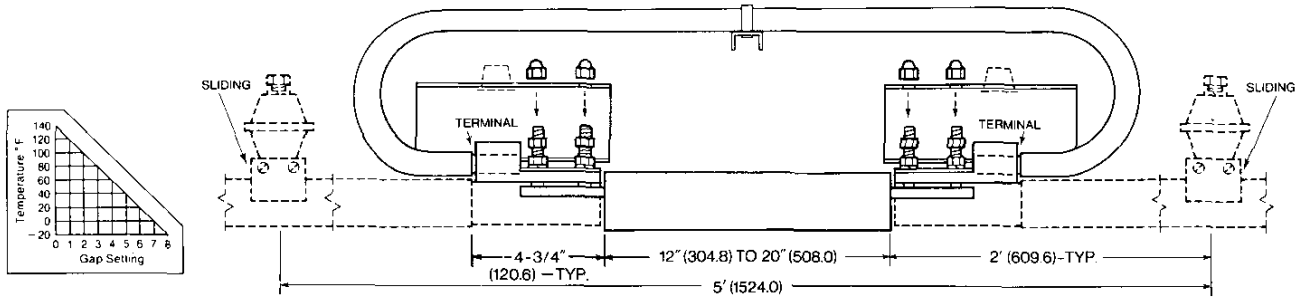
Bare Rail Hangers comprise a spool having a ½" stud to secure the spool to the hanger bracket and an internal hanger to engage and support the rail in sliding position. When used on HC-Silicone high temperature systems, the insulation is slit at the selected hanger point and the hanger clamp is inserted through the insulation into the rail support cavity. the spool on the hanger is then turned clockwise to expand the hanger clamp into a sliding support condition. The exposed part of the hanger is protected by a flexible cover.

After the hanger clamp is attached to the conductor, the hanger clamp spool is bolted to the hanger bracket.

Anchor Clamp Kit is an insulated keeper straddling each side of the standard hanger clamp for PVC and Lexan insulated systems. The hanger clamp mounting bolt is replaced by a cup point set screw that is tightened against the keeper plate at the desired hanger bracket location. On standard non-spool hangers, the set screw becomes the mounting bolt. On spool type hangers, the set screw is threaded into the base of the insulator spool.

For bare or silicone insulated systems, an internal rail hanger is used and the locking version has the washer between the spool and hanger removed to allow full tightening of the internal hanger to the rail. A protective flexible cover is required to insulate the exposed portion of the hanger clamp. Bare rail systems use the internal hanger plus a suitable spool insulator.

An anchor hanger clamp comprises the selected systems hanger plus an anchor clamp kit or modification. They are designated with the suffix "A", i.e.: HA-1000HA.



Expansion Gap Assemblies are preassembled, ready to be installed between two adjacent sections of rail. *Each end of the expansion* mechanism is attached to its mating rail end with a power feed type rail splice. The expansion mechanism is a telescoping interleaved unit, having a travel of 8 inches, providing a constant sliding surface for the collector shoe for mechanical support only. The gap assembly is 12 inches long closed, and 20 inches expanded. The gap assembly should be set at 4" when installed at 60°F for average use.

Expansion gap assemblies are based on 500 foot conductor intervals with a 100°F temperature variation. Aluminum conductors *will expand one inch in 70 feet per* 100°F temperature variation. If greater temperature variations are expected, a proportional decrease in the 500 foot interval is required. Conductor systems up to 500 feet in length that are either all indoors or all outdoors can be center anchored and do not require an expansion gap assembly. Systems that are longer than 500 feet require expansion gap kits every 500 feet or fraction thereof. Systems that pass from inside to outside in areas of extreme temperature variation should have an expansion gap kit located just within the building.

The center point of all conductor runs using expansion gaps requires an anchor clamp kit to locate rail settings.

Jumper cables across the mechanism from the power feed rail *splices* complete the electrical circuit around the expansion mechanism. Tandem collectors are required on any crane runway system using expansion gap kits to provide current draw when passing through the expansion gap mechanism.

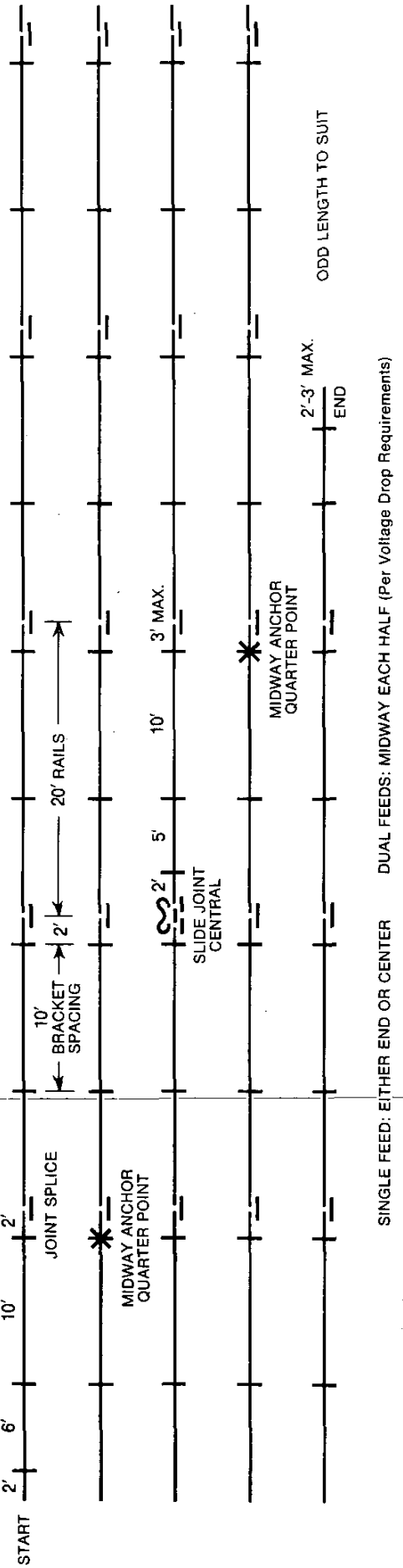
To properly support the conductor and to keep standard rail overhang to 2 feet, space the first two brackets on 6 foot centers and all other brackets on 10 foot centers. At expansion gaps keep the slide mechanism within 2 feet of brackets by adding an extra bracket 5 feet from the nearest regular bracket.

Two inch air gap expansion gap kits are available and recommended for the following condition: High temperature applications where excessive movement of the rail could cause wear on the silicone insulating cover and possible distortion or misalignment of either the insulated or bare conductor rail. Midpoints of the conductor rail between air gaps will require an anchor clamp kit as with the interleaved unit. These should be located to accommodate the 1"/70'/100°F expansion rate of the conductor rail.

Isolation Joints are required for circuit segmentation and comprise two insulating angles with attachment hardware to secure and space the adjacent rails.

INSTALLATION DATA SAF-T-BAR Series H Conductor

Typical Single Conductor Runway Layout (continuous)



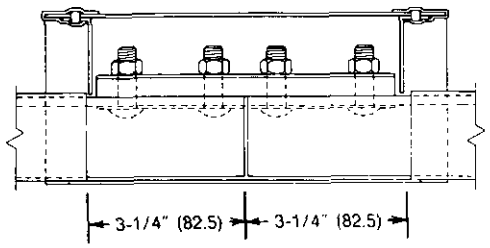
SAF-T-BAR Series H Parts List

Item	Amps	Weights Lbs.	Weights Kilos	Cat. No.
20' Conductor Sections				
Insulated PVC	500 amp	24.0	10.88	HA-500-1
	750 amp	24.0	10.88	HA-750
	1000 amp	30.0	13.60	HA-1000
	1500 amp	60.0	27.20	HA-1500
Insulated Medium	500 amp	24.0	10.88	HA-500-1H
Heat Lexan	750 amp	24.0	10.88	HA-750H
	1000 amp	30.0	13.60	HA-1000H
	1500 amp	60.0	27.20	HA-1500H
Bare	500 amp	19.0	8.60	HB-500-1
	750 amp	19.0	8.60	HB-750
	1000 amp	26.0	12.00	HB-1000
	1500 amp	55.0	25.00	HB-1500
Insulated High	500 amp	24.0	10.88	HC-500-1
Heat Silicone	750 amp	24.0	10.88	HC-750
	1000 amp	30.0	13.60	HC-1000
	1500 amp	60.0	27.20	HC-1500
Fiber Glass	500 amp	34.0	15.42	HA-500FI
Insulating Cover	750 amp	34.0	15.42	HA-750FI
	1000 amp	40.0	18.15	HA-1000FI
Powerfeed	500 amp	3.0	1.36	HA-500F
	750 amp	3.0	1.36	HA-750F
	1000 amp	3.0	1.36	HA-1000F
	1500 amp	6.0	2.75	HA-1500F
Joint Kit with Cover	500 amp	1.0	.45	HA-500J
	750 amp	1.5	.68	HA-750J
	1000 amp	2.0	.90	HA-1000J
	1500 amp	3.0	1.36	HA-1500J
Hanger Clamps				
Hanger Clamps		.5	.23	HA-1000H
Spool Clamp		1.0	.45	HA-1000K
Internal Clamp		1.0	.45	HB-1000QH
Internal Clamp		1.0	.45	HC-1000QH
Lexan Clamp		.5	.23	HA-1000P
Anchor Hangers				
Anchor Kit with Hanger Clamp		.6	.27	HA-1000HA
Anchor Kit with Spool Hanger		1.1	.50	HA-1000KA
Anchor Type with Lexan Hanger		.6	.27	HA-1000PA
Expansion Gap Kit, Assembled	500 amp	13.0	5.90	HA-500XG-8"
	750 amp	13.0	5.90	HA-750XG-8"
	1000 amp	15.0	6.80	HA-1000XG-8"
	1500 amp	20.0	9.07	HA-1500XG-8"
Isolation Joint		2.0	.90	HA-1000IS
End Caps	500 amp	.5	.23	HA-500-N
	750 amp	.5	.23	HA-750-N
	1000 amp	.5	.23	HA-1000-N
	1500 amp	.75	.34	HA-1500-N
Collectors				
Single Arm - 6" Shoe		3.8	1.72	HA-300LS
Single Arm - 8" Shoe		5.0	2.25	HA-400LS
Tandem Arm - 6" Shoe		7.0	3.17	HA-600LLS
Tandem Arm - 8" Shoe		10.0	4.5	HA-800LLS
Collector Parts				
Shoe - 6 inch		.5	.23	300SHP
Clip - 6 inch		.3	.14	300YHP
Shoe - 8 inch		.7	.32	400SHP
Clip - 8 inch		.4	.18	400YHP
Shoe Insulator		.5	.23	1000Q
Arm		1.0	.45	300LP
Bracket Pair		1.0	.45	300BB
Spring Pair		.5	.23	300ZZ

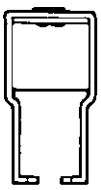
Pig Tail #2 AWG x 30" - Two Per Head Required.

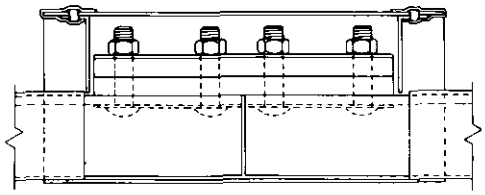
HOWELL CORPORATION
1180 Stratford Road, Stratford, Connecticut 06497

JOINING

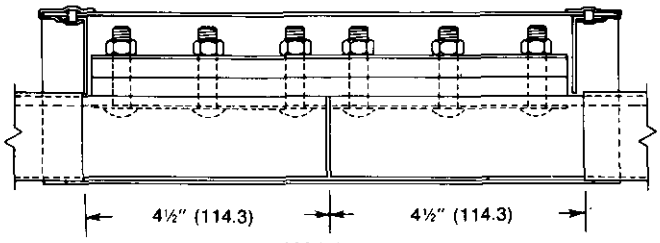


Splice Joint HA-500J AL Plate Illustrated





HA-750J AL Plate



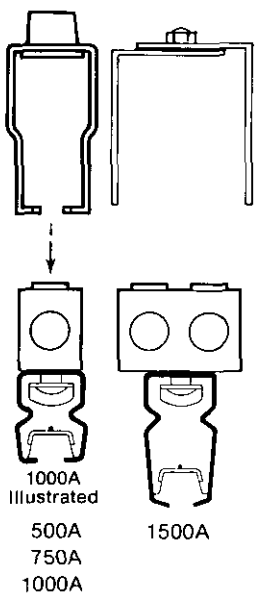
HA-1000J Illustrated

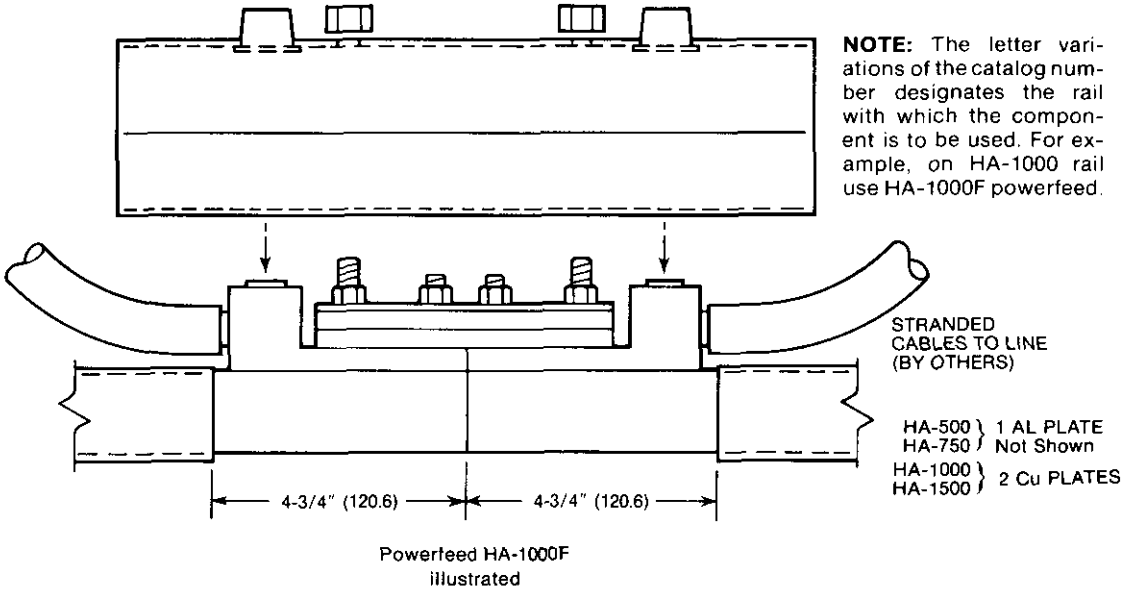
Splice Joint { HA-1000J - AL Plates / HA-1500J - CU Plates

Joining sections by a bolted splice is as easy as A, B, C.

Conductors are joined by a bolted splice assembly, comprised of two spring plates, splice bar(s), steel bolts, and hex assembly nuts. The conductor assemblies are aligned at the joint by the inside spring plate, which when pulled flat when the rail splice is tightened, will align the adjacent rail section. The longitudinal cavity in the conductor adjacent to the stainless steel running face may be used as a heater wire cavity if required.

To join the adjacent conductor rails, abrade the joint surfaces of the conductor rail only, with a fine wire brush or abrasive cloth, coat thoroughly with Alcoa #2EJC compound immediately after abrading. *Do not abrade splice bars or terminals, as they are tin plated to be corrosion free.* Assemble joint without removal of compound. Tighten assembly nuts until the joint is fully torqued. Snap the insulating splice cover into place to complete the joint. Make certain that the splice joints are at least 24 inches away from a hanger clamp to allow for adequate expansion and contraction movements of the rail assembly. Joints on H, HC, FI Series are not as illustrated. Consult factory for details.





Powerfeed HA-1000F illustrated

NOTE: The letter variations of the catalog number designates the rail with which the component is to be used. For example, on HA-1000 rail use HA-1000F powerfeed.

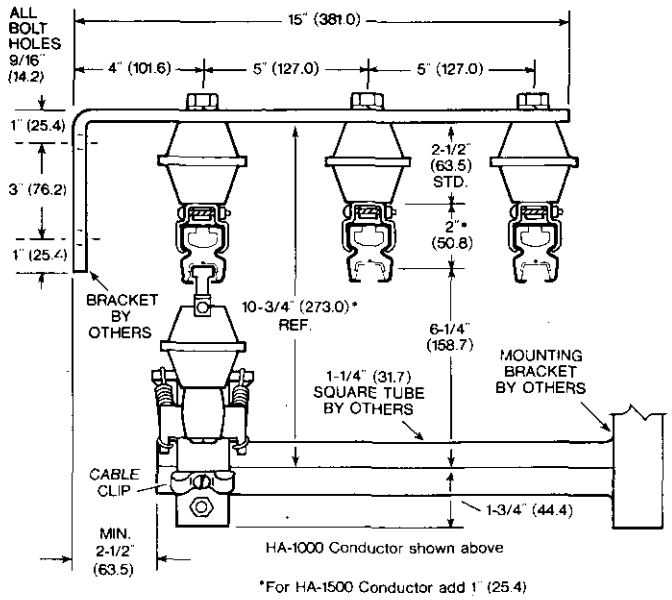
Powerfeeds for Supply Power connections are designed to be installed instead of a rail splice joint, where required. A suitable insulating cover is provided so that the terminal face is protected from accidental contact. Installation of powerfeed joints is the same procedure as for regular conductor rail splices. It is necessary to cut the insulating cover back by an additional 1½" to accept the increase in length of a powerfeed over a splice joint.

Powerfeed conductor bar surfaces are prepared with electrical joint compound using the same procedure as on conductor splices. HA-500F/HA-750F powerfeeds have two 350MCM terminals. HA-1000F powerfeeds have two 600MCM terminals and HA-1500F powerfeeds have two 350-2MCM terminals. Higher amperages are accomplished by grouping multiple terminals.

End Cap. Standard length rail having 3¼" exposed ends may be insulated by a 4" flexible boot or end cap. Standard and short length rail ends may be insulated by a 4" extension of the cover beyond exposed rail and be designed as end lengths.

Cutting. Power rail may be field cut with a hacksaw as required. Remove all sharp edges on cut end of conductors by deburring with a file.

Series H COLLECTORS



The collector is basically a self lubricating copper graphite shoe, held in a copper base, which is supported by a spool insulator and is held firmly against the conductor by spring loaded linkages.

This collector arrangement is suitable for all types of environments, from clean to dirty areas. It is also compatible with rigid insulating covers or silicone rubber insulating covers.

Each collector head has two screw type terminals, one each end of the collector. Two extra flexible #2AWG wires per collector head are supplied as a standard. Either single or tandem collectors may be ordered depending on the required amperage load.

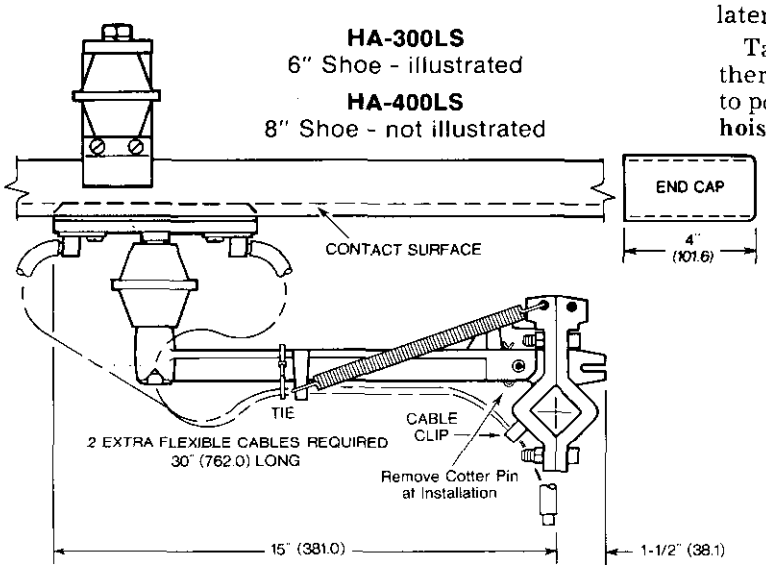
The type L (single) and type LL (tandem) have linkages fabricated of aluminum allow and include a spring loaded arm with collector head and yoke swiveled at one end. The spring loaded are swivels in a socket base to provide for horizontal misalignment. The collector has a 2" stroke and a 3" drift. The base clamps to a 1¼" square bar (not furnished). The springs allow for vertical and lateral misalignment and apply pressure to the collector shoe throughout the stroke. Shoe pressure is set at 20 lbs. Collectors may be mounted vertically or laterally without special additional equipment.

Tandem (LL) collectors should always be used where there are expansion gaps in the system, and where used to power magnetic lifts. **Collector ratings for crane and hoist duty as per NEC Code, Article 610.** Collector catalogue numbers are for identification only.

Self centering collectors and pick-up guides are available for discontinuous circuits. Collector amperage capacity must be able to match conductor usage, otherwise collector can destroy conductors.

HA-300LS
6" Shoe - illustrated

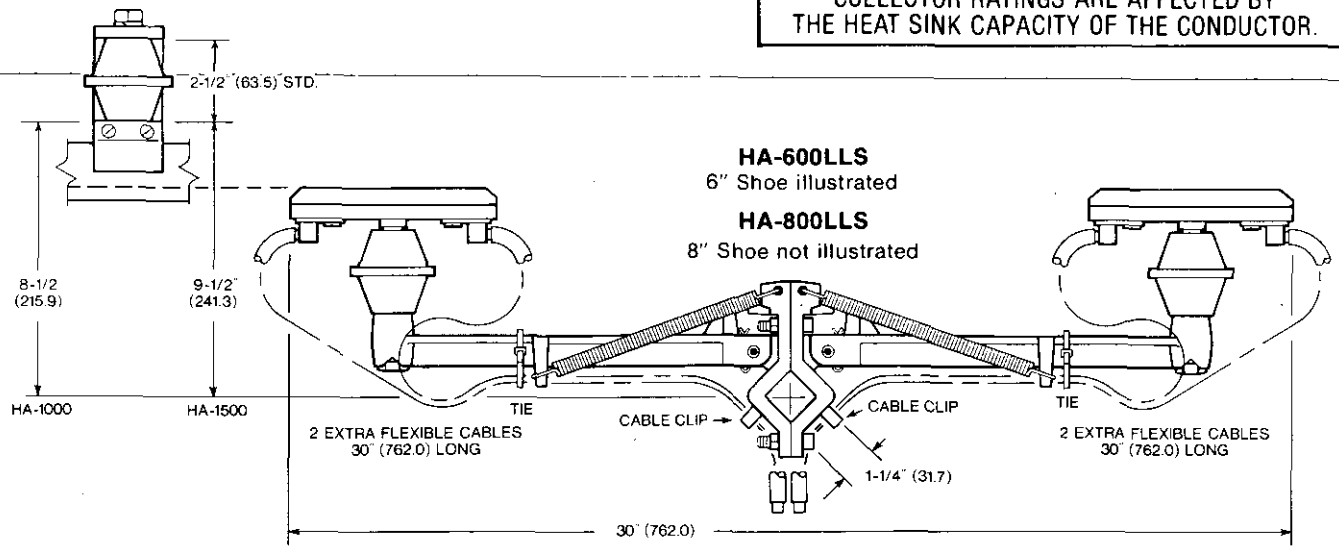
HA-400LS
8" Shoe - not illustrated



SINGLE COLLECTOR SHOE SELECTION CHART			
CONDUCTOR	RATING	6" SHOE	8" SHOE
HA-500	Intermittent Continuous	200A 160A	260A 210A
HA-1000	Intermittent Continuous	230A 180A	300A 255A
HA-1500	Intermittent Continuous	300A 225A	400A 320A
COLLECTOR RATINGS ARE AFFECTED BY THE HEAT SINK CAPACITY OF THE CONDUCTOR.			

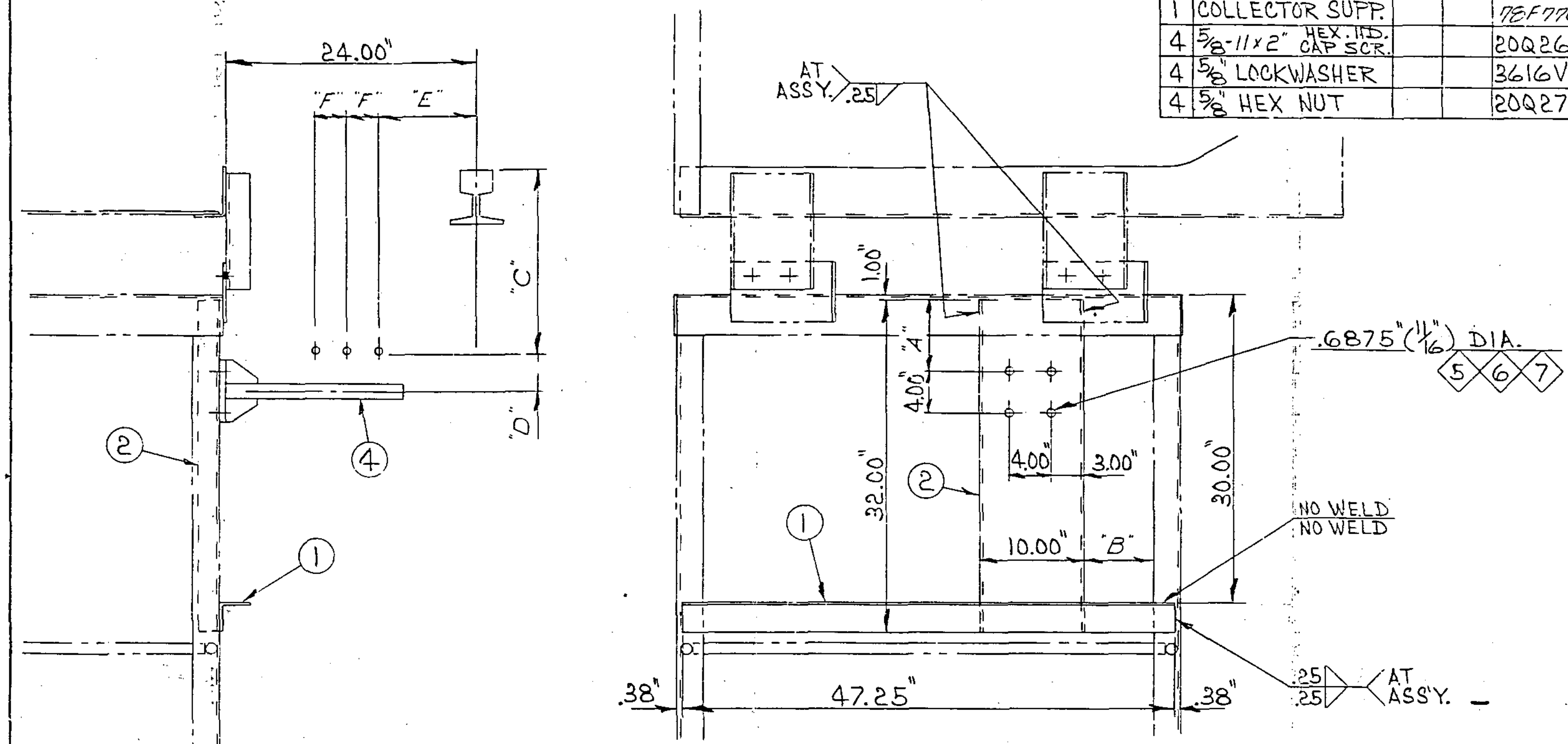
HA-600LLS
6" Shoe illustrated

HA-800LLS
8" Shoe not illustrated



29E7867 SH 1 OF 1

NO REQ F2	DESCRIPTION	MATERIAL NO P&H		PART NO (PN) SEMI-FNSH(PN)	UNIT WT RGH	FNSH	REF SH	IT NO
1	L3"x3"x5/16"x47.25"	180	ASTM A36		24			1
1	C10"@15.3#x32.00"	"	"		41			2
								3
1	COLLECTOR SUPP.			78F770D14				4
4	5/8-11x2" HEX. HD. CAP SCR.			20Q260D404				5
4	5/8" LOCKWASHER			3616V013				6
4	5/8" HEX NUT			20Q270D40				7



	"A"	"B"	ITEM # 4	WGT.	"C"	"D"	SERVICE CAGE LOCATION	"E"	"F"
29E7867F1	6½"	6"	78F776D17	78#	18"	3½"	SHOWN R.H.	9¼"	3"
29E7867F2	13½"	6"	78F770D16	78#	19½"	6¼"	SHOWN R.H.	9 5/16"	3½"

CI-29518

AWS-D14.1#

ALL WELDS SHALL BE MADE WITH 70000 PSI TENSILE STRENGTH FILLER METAL. WELD JOINTS ARE TO BE PREHEATED TO 70°F MINIMUM UNLESS HIGHER PREHEATS ARE SPECIFIED IN WELD SYMBOLS.

ALL DIMENSIONS ARE IN DECIMAL INCH (UNLESS OTHERWISE NOTED) FULL SCALE .02 GRAD. .05 GRAD. .10 GRAD.

SUFFIX NO	INITIALS DATE	CHNG MARK	CHANGE	DWG BY	CHKD BY	CH ENGR
F2	LRS 12-4-87					
F1	CMH 7-1-87					

SURFACE MARKED THUS √ MUST BE WITHIN A ROUGHNESS VALUE OF 250 MICROINCHES UNLESS OTHERWISE SPECIFIED

GENERAL TOLERANCE NOTES

DECIMAL PLACE	STRUCTURAL	MACHINING
(1) X.X	±.06"	±.040
(2) X.XX		±.020
(3) X.XXX		±.010
(4) X.XXXX		±.005

EXCEPTIONS:
1. DIM. WITH TOL. UNDER ± .005 TO BE SHOWN AS NOM. DIM. ± TOL. E.G. 2.000 ± .002
2. USE ∇ TO INDICATE DECIMAL PLACE TOLERANCE OTHER THAN IMPLIED BY ORIGINAL DECIMAL DIMENSION. E.G. 0.∇25 = ONE PLACE TOL.

PART NO | HEAT TREATMENT OR PROCESS SPECS
EST COMPLETE PART WEIGHT RGH FNSH
DWN BY CMH DATE 7-1-87 | SCALE 1½" = 12" | THIRD ANGLE PROJECTION
TR BY DATE | RELEASE DATE 7-7-87
CHKD BY MC DATE 7-3-87 | SIMILAR TO: 29A8373
CH ENGR DATE 7-7-87 | TITLE MAINLINE COLL. SUPP.
PROJ ENGR | PROD OR MODEL CRANES
DWG NO 29E7867

Harnischfeger P&H

Harnischfeger OCT 27 '87 11:34 HARNISCHFEGER DALLAS

P&H INSTRUCTIONS FOR PROCESSING CRANE ORDERS

CRANE NO. C I 2.463 F

DATE 10/26/87 REV. ____

CUSTOMER ORDER NO. SIGNED AGREEMENT

ITEM 1 (*) PARCEL POST & TRUCK SHIPMENTS

COMPANY LOUISVILLE AND JEFFERSON COUNTY RIVERPORT AUTHORITY

ADDRESS P.O. BOX 35010 6219 CANE RUN ROAD

CITY LOUISVILLE, KENTUCKY 40258

ATTN. OF LARRY D. McFALL VICE PRESIDENT

ITEM 2 (*) SEND SHIPPING NOTICE TO

COMPANY ____

ADDRESS SAME AS #1

CITY ____

ATTN. OF ____

C.C. OF WIRE TO: ____

ITEM 3 (*) OPERATION & MAINTENANCE AND REPLACEMENT PARTS MANUALS

UPS DELIVERY ONLY

O.& M. MANUALS FOR APPROVAL 0

FINALS: O.& M. 8 R.P. 8

COMPANY ____

ADDRESS SAME AS #1

CITY ____

ATTN. OF ____

MHC: MPH

ITEM 4 (*) ERECTION INFO., DWGS. & PACKING LIST

A. IS P&H SUPERVISION ORDERED? (YES) NO

B. IS ERECTION BY P&H INCLUDED? (YES) NO

DWGS.: PRINTS 3+2 SEPIAS ____

COMPANY ____

ADDRESS SAME AS #5

CITY 3 SETS TO CUST, 2 SETS TO ERECTOR

ATTN. OF ____

ITEM 5 (*) APPROVAL DWGS. & DOCUMENT REQUIREMENTS SEND DIRECT TO OFFICE ☐

COMPANY HAZELET + ERDAL, INC. CONSULTING ENGINEERS

ADDRESS 304 WEST LIBERTY ST.

CITY LOUISVILLE, KENTUCKY 40202-3004

ATTN. OF ROBERT O. GRUBBS

SEE ITEM 7 FOR SUPPLIMENTAL REQUIREMENTS ☒

	CIRCLE QUANTITY IF FOR INFO. ONLY	CUSTOMER APPROVAL: PRINT	SEPIA	AUTO-POSITIVE	MYLAR	APERTURE CARD	FIELD OFFICE PRINT	CUSTOMER DUE DATE	APPROVAL REQ'D DATE
1. BR. & TR. LAYOUTS (WHEN REQ'D)		5					2		
2. CERTIFIED CLEARANCE DWGS.		5					2	A	
3. RUNWAY CONDUCTOR (IF ORDERED)		5					1	S	
4. CAGE DWG. (FOR ACCESS. INFO.)		5					1	A	
5. CAB LINE OF VISION (~~ADD'L~~ DRWG $)		5					1	P	
6. HOOK (MAIN ~~& AUX.~~)/BUCKET DETAIL		5					1		
7. MAJOR STRUCTURAL (ADD. $)									
8. MACHINERY - SUB.ASSEM. (ADD. $)									
9. ELEMENTARY DIAGRAM		5					1		
10. INTERCONNECTION W.D.		5					1		
11. PIN LOCK DETAIL DRAWINGS		5					1		
12. CALCULATIONS ** (ADD. $)		5					1		
13. MOTOR DATA SHEETS (WHEN REQ'D)									
14. QUALITY ASSURANCE DOCUMENTS									

FINAL DRAWINGS AND ADDED REQUIREMENTS SEE SHEET 2

SPECIAL STAMP INFO.- IF REQ'D. LOUISVILLE AND JEFFERSON COUNTY RIVERPORT AUTHORITY 30 TON CRANE CRANE NO. CI 25638

(*) NOTE: FOR OTHER THAN U. S. MAIL DELIVERIES STREET ADDRESS AND PHONE NUMBER IS REQUIRED

** BASIC STRUCTURAL DESIGN DATA (GAGER COMPUTER RUN)

01-1069-2 REV. 7-17-87

Harnischfeger OCT 27 '87 11:34 HARNISCHFEGER DALLAS CUSTOMERS

P&H

INSTRUCTIONS FOR PROCESSING CRANE ORDERS

CRANE NO. C I P 5 2 1638

DATE 10/26/87 REV. _____

CUSTOMER ORDER NO. SIGNED AGREEMENT

ITEM 6 (*) FINAL REQUIREMENTS - WHEN CONTRACTED FOR

A. DESTINATION

COMPANY LOUISVILLE AND JEFFERSON COUNTY RIVERPORT AUTHORITY

ADDRESS 6219 CANE RUN ROAD

CITY LOUISVILLE, KENTUCKY 40258

ATTN. OF LARRY D. McFALL VICE-PRESIDENT

B. MEDIA

1.	BLUE LINE PRINT _____ SETS	5.	AUTO-POSITIVE (PAPER) _____ SETS
2.	BLACK LINE PRINT _____ SETS	6.	APERTURE CARD _____ SETS
3.	SEPIA _____ SETS	7.	OTHER (SPECIFY) _____ SETS
4.	MYLAR ONE SETS		_____

C. SELECTION 1 (INSERT NUMBER FROM ONE OF THE FOLLOWING:)

1. ONLY THOSE SUBMITTED FOR APPROVAL.
2. SAME AS ABOVE PLUS MAJOR ASSEMBLIES, MAJOR STRUCTURAL AND WIRING DIAGRAMS.
3. SAME AS ABOVE PLUS WEARING PARTS WHICH INCLUDES SUCH ITEMS AS GEARCASES, SHAFTS, HOOKS, SHEAVES AND SHEAVE PINS, COUPLINGS, AXLE BOXES, ETC.
4. ALL DRAWINGS AND DIAGRAMS BUT NOT INCLUDING HARDWARE, BEARING, SEALS, ETC.
5. ALL DRAWINGS AND DIAGRAMS BUT NOT INCLUDING HARDWARE.
6. ALL DRAWINGS AND DIAGRAMS.

NOTE: SELECTIONS 2 THROUGH 6 ARE FURNISHED AT ADDITIONAL COST.

D. SPECIAL REQUIREMENTS - AT ADDITIONAL COST

1. DRAWINGS MUST BE GROUPED ON LARGE SHEET - (NO) YES (MAXIMUM SIZE _____)
2. SPECIAL GROUPING REQUIRED - (NO) YES (STD.- RANDOM BUT SEPARATING BR. & TR.)
   SPECIFY- _____
3. CUSTOMER TITLE BLOCK REQUIRED - (NO) YES (IF YES ATTACH COPY)
4. CUSTOMER TITLE BLOCK TO BE FILLED IN (CUST. DWG. NO. ETC.) - (NO) YES
5. SPECIAL STAMP OR DECAL REQUIRED ON DRAWINGS - NO (YES) (IF YES, ATTACH COPY)
6. SPECIAL TABULATION REQUIRED - (NO) YES (STD.- 8-1/2 X 11 CROSS INDEX LISTING)
   SPECIFY- _____
7. DRAWINGS MUST BE CERTIFIED - NO (YES)
8. SPECIAL INFO ON APERTURE CARD - (NO) YES (STD.- DWG. NO. & REV.)
   SPECIFY- _____

E. FINAL PAYMENT DEPENDENT ON DRAWING DELIVERY - NO (YES)

ITEM 7 SUPPLEMENTAL REQUIREMENTS

APPROVAL DRAWINGS TO BE SUBMITTED VIA OVERNITE MAIL OR SPECIAL COURIER

PHONE # IS 502-935-6029 AT LOUISVILLE AND JEFFERSON COUNTY RIVERPORT AUTHORITY

PHONE # IS 502-583-2723 AT HAZELET & ERDAL, INC.

DISTRIBUTION TO	✓	BY
MECH. ENG. DEPT.		
ORDER PROCESS (2)		
ELEC. ENG. DEPT.		
TRAFFIC DEPT.		
SERVICE DEPT.		
PUBLICATIONS		
DOCUMENT CONTROL		

01-1069-2
REV.7-17-87

MASTER

NOTICE OF BOOK SHIPMENT

TO:

Louisville/Jefferson Riverport Authority
6219 Cane Run Raod
Louisville, Kentucky 40258
Mr. Larry D. McFall

FROM:

Harnischfeger Corporation
P.O. Box 310
Milwaukee, WI 53201
Technical Publications

June 7th, 1988

The following Care and Operation Manuals are for the Type CI Overhead Bridge Crane purchased on your order number signed agreement, which is identified by Harnischfeger serial number CI-29638.

QTY	DESCRIPTION	SERIAL NO.
8	Care and Operation Manual	CI-29638

cc: file

Index for Crane CI-29638 Operation and Maintenance Manual

Bulletin No.	Title
Catalog 216-1	Safe Operating Practices for Crane and Hoist Users
HDC-100	Type CI Overhead Crane Care and Operation Manual Maintenance, Instruction and Repair Information
ED-8	Type DB-135, DB-270, and DB-540 Power Circuit Limit Switch
EPD-106	Bulletin 562/563 Static Stepless Control
G99760	Installation, Maintenance, and Operating Instructions, Cable Reel
LINTERN	Instruction Manual, Cab and Pulpit Air Conditioners, Lintern
	Wiring Diagrams
101A14302	Elementary Wiring Diagram
CG99760-1	Wiring Diagram, Power Cable reel, Gleason

GLEASON REEL CORP., P.O. Box 26, 600 South Clark Street, Mayville, WI 53050, (414) 387-4120, Telex 26-753

INSTALLATION - MAINTENANCE - OPERATING INSTRUCTIONS

HARNISCHFEGER CORP.

Customer P.O. No. MC-36-224618
Gleason Order No. G99760

Direct TR Motor Reel
Bolted Spool Construction

Model No. TR1-203-285B56-28022-J1

1-7-88

TR SERIES MOTOR DRIVEN ELECTRIC CABLE REEL

Maintenance and Operating Instructions

ELECTRICAL

The stable torque characteristics of the TR unit when de-energized permits successful cable reeling on the basis of energizing the motor for cable recovery only. In the interest of minimum operating costs and obtaining maximum life from the renewable friction pads, it is, therefore, preferable to connect the reel motor for energization only when cable recovery is required. (NOTE: The reel motor rotates in the direction of cable recovery only and is not reversed for cable payout).

The following two sections describe the motor control packages that are optionally supplied by Gleason for use in the one-way and two-way payout applications. If the TR motor control package is not supplied by Gleason, it is the customer's responsibility to provide an equivalent control package. Failure to do so may result in the invalidation of the TR warranty.

Gleason One-Way Payout Motor Control Circuit

The optional one-way payout control package consists of the following components:

Fusible Disconnect Switch	1DS & 1FU-3FU
Control Circuit Transformer	1CT
Control Fuse Block & Fuse	4FU
Pilot Light	1PL
AC Full Voltage Starter	1M & 1OL
AC Timing Relay	1TD
AC Control Relay	1CR
Terminal Block	

Assume that a TR reel is recovering cable, which is supplying power to the motor of a moveable object (e.g. a gantry crane). The crane motor has its own motor control circuit, giving an operator the ability to start and stop the crane. An auxiliary contact from the crane motor starter must be wired into the reel motor control circuit via the supplied terminal block, and is used to control the energization of the reel motor. Because of the crane's momentum, crane motion will continue for a short length of time after the crane motor has been de-energized. If the reel motor was

de-energized concurrently with the crane motor, crane motion would continue for a short time, whereas the reel would no longer be recovering cable. For this reason, a field adjustable timer 1TD has been incorporated into the circuit to maintain cable recovery until crane motion has ceased.

Closure of the crane motor starter auxiliary contact will energize the timing relay coil 1TD, causing instantaneous closure of the 1TD contact and energization of the reel motor starter magnet coil 1M. The 1M contacts will close and the reel motor will be energized. The opening of the crane motor starter auxiliary contact will cause de-energization of coil 1TD. After the set time delay, the 1TD contact will open. The 1M coil will be de-energized, the 1M contacts will open, and the reel motor will be de-energized.

The circuit is equipped with a control interlock relay 1CR. If either the AC motor starter overload relay 1OL trips or the control circuit becomes de-energized, the reel motor will be de-energized. In addition, the 1CR contacts will change state, giving an indication to the crane that the reel de-energization has occurred. Pilot light 1PL gives a visual indication that the control circuit is energized.

Gleason Two-Way Payout Motor Control Circuit

The optional two-way payout control package consists of the following components:

Fusible Disconnect Switch	1DS & 1FU-3FU
Control Circuit Transformer	1CT
Control Fuse Block & Fuse	4FU
Pilot Light	1PL
AC Full Voltage Starter	1M & 1OL
AC Timing Relay	1TD
AC Timing Relay	2TD
Limit Switch	1LS
AC Control Relay	1CR
Terminal Block	

The two-way payout option ensures that the TR reel motor will be energized only during cable recovery in a two-way payout retrieve or stretch application. This is accomplished by sensing the direction of reel shaft rotation through the use of a limit switch, timing relay and cam configuration. In the neutral position, the limit switch contact 1LS is normally closed. Depending upon the direction of motor reel rotation, a cam that is attached to the reel motor shaft will push the limit switch lever arm either to the clockwise or counterclockwise position. For standard TR reel operation, reel rotation during cable recovery is in the counterclockwise direction - when viewing the reel from the collector side of the reel. Therefore, during counterclockwise reel rotation (i.e. cable recovery) the limit switch contact will remain closed; whereas during clockwise rotation (i.e. cable payout) the limit switch contact will open. Because of the cam configuration, the

limit switch senses direction of rotation only once per shaft revolution. A field adjustable timer 2TD is used to bypass the limit switch contact until the limit switch has had an opportunity to sense rotational direction. As such, this timer must be set to remain closed for at least one revolution of the motor reel shaft.

Assume that the TR reel is being used in a two-way payout retrieve application (e.g. on a center fed gantry crane). The crane motor has it own motor control circuit, giving an operator the ability to start and stop the crane. Two auxiliary contacts from the crane motor starter must be wired into the motorreel motor control circuit via the supplied terminal block - one corresponding to forward crane motion and one corresponding to reverse crane motion. These contacts are used to control the energization of the reel motor. Because of the crane's momentum, crane motion will continue for a short length of time after the crane motor has been de-energized. If the reel motor was de-energized concurrently with the crane motor, crane motion would continue for a short time, whereas the reel would no longer be recovering cable. For this reason, a field adjustable timer 1TD has been incorporated into the circuit to maintain cable recovery until crane motion has ceased.

Assume that the reel is to the left of the center point, and that the reel must rotate in a counterclockwise direction to recover cable as the crane moves in a forward direction toward the center point (see figure #2). Assume that the crane operator pushes the forward button in the crane motor control circuit. This causes the forward crane motor contacts and auxiliary contact to close. Closure of the crane motor contacts causes the crane motor to be energized in the forward direction, initiating forward crane motion. Closure of the forward auxiliary contact, which is wired into the reel motor control circuit, causes energization of timing relay coils 1TD and 2TD. The normally open, timed open 1TD contact will instantaneously close; and the normally closed, timed open 2TD contact will remain closed. This allows current to flow through the 1TD contact, the 2TD contact, and through the motor starter magnet coil 1M. The 1M contacts will close, and the reel motor will be energized. Because of the cam configuration, limit switch 1LS senses direction of rotation only once per shaft revolution. As such timer 2TD acts as a limit switch bypass timer. The contact of 2TD must remain closed for at least one shaft revolution, ensuring that the limit switch has had an opportunity to sense rotational direction. In the case where rotation is in the counterclockwise direction (indicating cable recovery), the contact of 1LS remains closed after 2TD times out. Current continues to flow through coil 1M, and the reel motor remains energized.

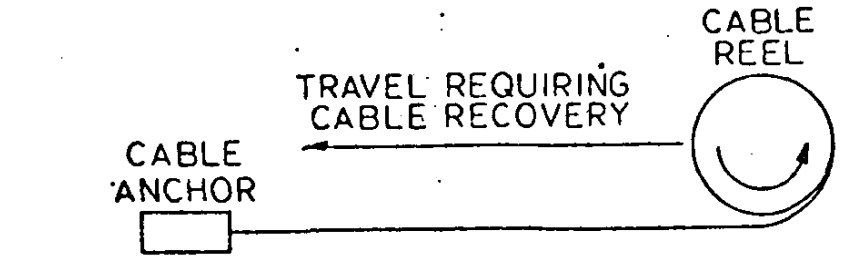
Now assume that the reel has crossed the center point, and that the shaft is being rotated in the clockwise direction (corresponding to cable payout). As soon as 1LS senses clockwise shaft rotation (during the first shaft revolution), the 1LS contact will be opened, halting the flow of current through coil 1M. The contacts of 1M will open, and the reel motor will be de-energized. In addition, the auxiliary 1M contact will open, ensuring that the reel motor will remain de-energized when the 1LS contact returns to closed during the rotation of the cam. When the crane operator pushes the stop button in the crane motor control circuit, the forward crane contacts

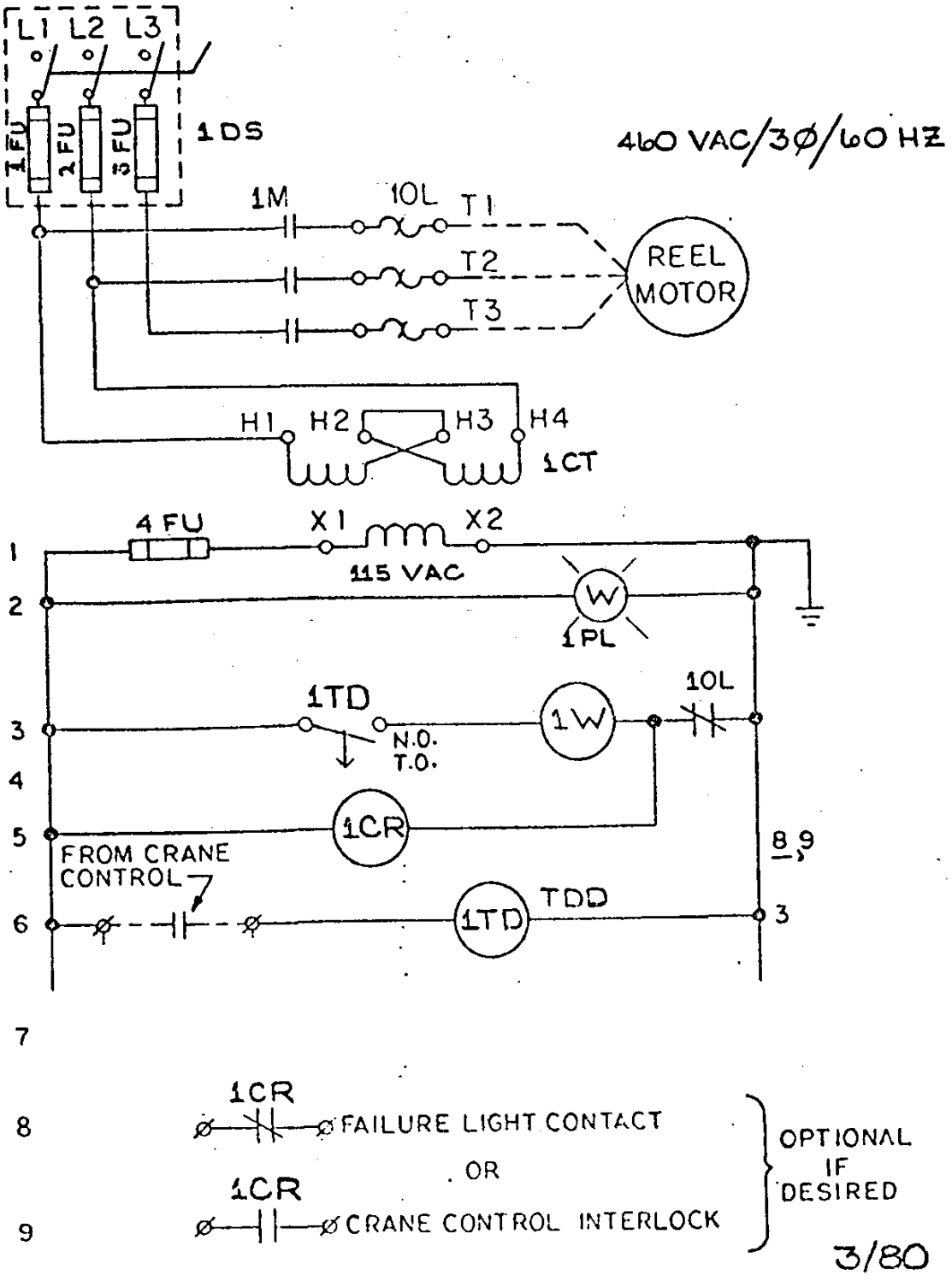
and auxiliary contact will open. The opening of the crane motor contacts causes the crane motor to be de-energized. Because of the momentum of the crane, forward crane motion will continue for a short length of time. Concurrent with the opening of the forward motor contacts, the opening of the auxiliary contact in the crane motor control circuit causes de-energization of the timing relay coils 1TD and 2TD. The 2TD contact will instantaneously close, and the 1TD contact will remain open for a set time delay. If this occurs during cable recovery (when the motor is energized), the motor will remain energized until 1TD times out. Timing relay 1TD should be set such that the reel will continue to recover cable until crane motion has completely halted. If the crane is stopped during cable payout (i.e. when the motor is de-energized), the motor will be energized until 1TD times out. This function is inherent in the circuit, and should not be a cause for concern.

The TR reel motor control circuit responds to reverse crane motion in a similar manner. The crane operator pushes the reverse button in the crane motor control circuit. This causes the reverse crane motor contact and auxiliary contact to close. Closure of the crane motor reverse contact causes the crane motor to be energized in the reverse direction, initiating reverse crane motion. The reverse auxiliary contact must provide the identical function as the forward auxiliary contact described for forward crane motion. As such, it is wired into the reel motor control circuit through the same pair of terminals as is the forward auxiliary contact.

The circuit is equipped with a control interlock relay 1CR. If either the AC motor starter overload relay 1OL trips or the control circuit becomes de-energized, the reel motor will be de-energized. In addition, the 1CR contacts will change state, giving an indication to the crane that the reel de-energization has occurred. Pilot light 1PL gives a visual indication that the control circuit is energized.

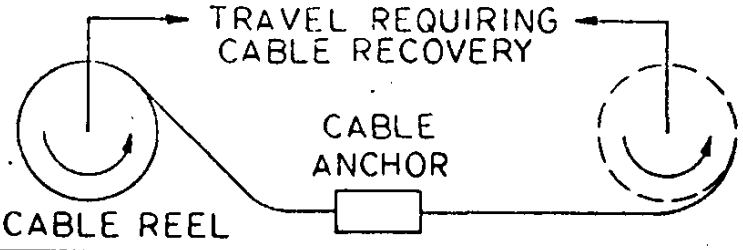
FIGURE 1

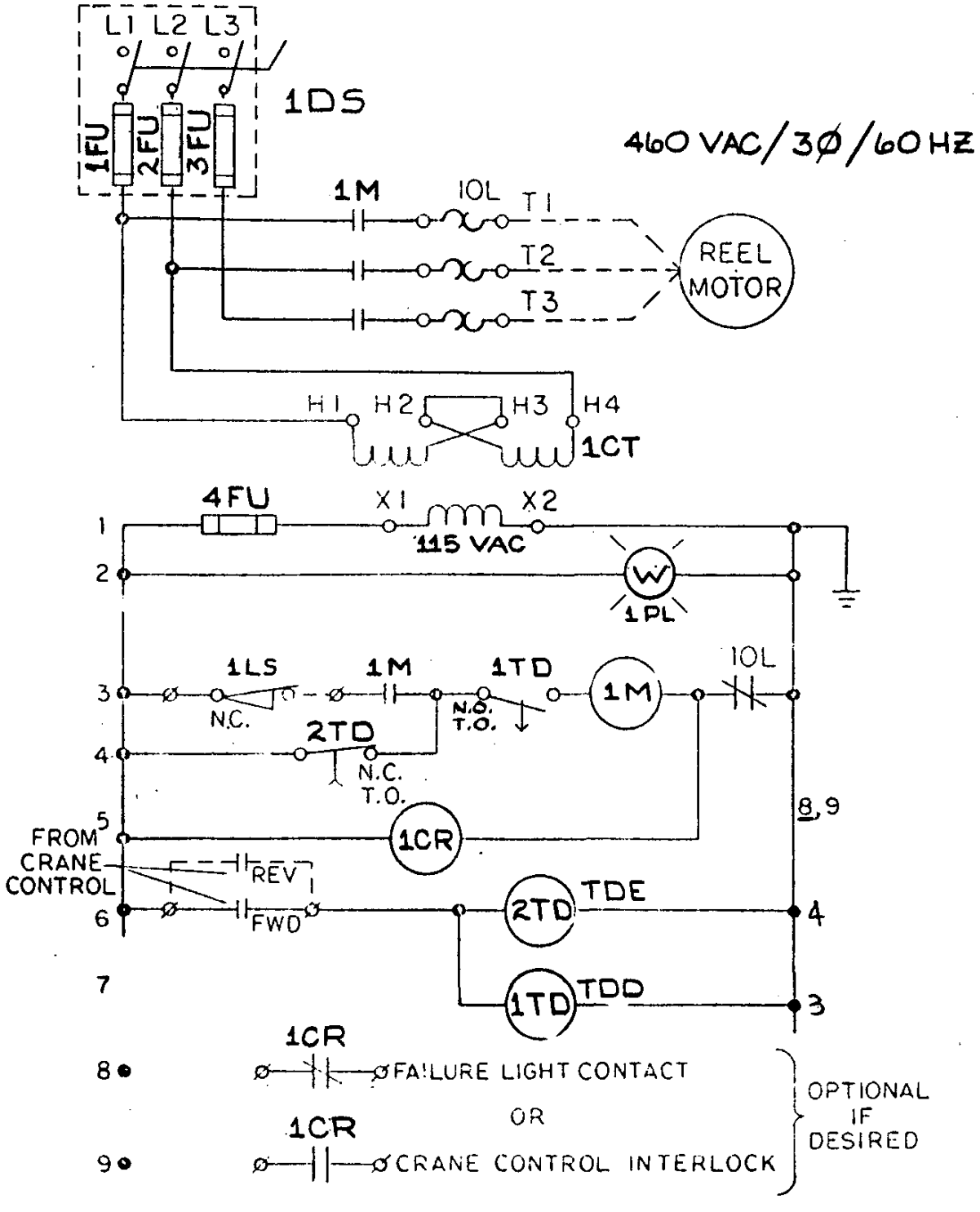

CABLE REEL
TRAVEL REQUIRING CABLE RECOVERY
CABLE ANCHOR


L1 L2 L3
1FU
2FU
3FU
1DS
460 VAC/3Ø/60 HZ
1M
10L
T1
T2
T3
REEL MOTOR
H1 H2 H3 H4
1CT
4 FU
X1
X2
115 VAC
W
1PL
1TD
N.O.
T.O.
1W
10L
1CR
FROM CRANE CONTROL
8 9
TDD
1TD
3
7
8
9
1CR
FAILURE LIGHT CONTACT
OR
1CR
CRANE CONTROL INTERLOCK
OPTIONAL IF DESIRED

3/80

FIGURE 2


TRAVEL REQUIRING
CABLE RECOVERY
CABLE
ANCHOR
CABLE REEL


L1 L2 L3
1DS
1FU
2FU
3FU
460 VAC/3Ø/60 HZ
1M
IOL
T1
T2
T3
REEL
MOTOR
H1 H2 H3 H4
1CT
4FU
X1
X2
115 VAC
1PL
1LS
1M
1TD
IOL
N.C.
N.O.
T.O.
2TD
N.C.
T.O.
1CR
8,9
FROM
CRANE
CONTROL
REV
FWD
2TD
TDE
1TD
TDD
1CR
FAILURE LIGHT CONTACT
OR
1CR
CRANE CONTROL INTERLOCK
OPTIONAL
IF
DESIRED

TORQUE ADJUSTMENT

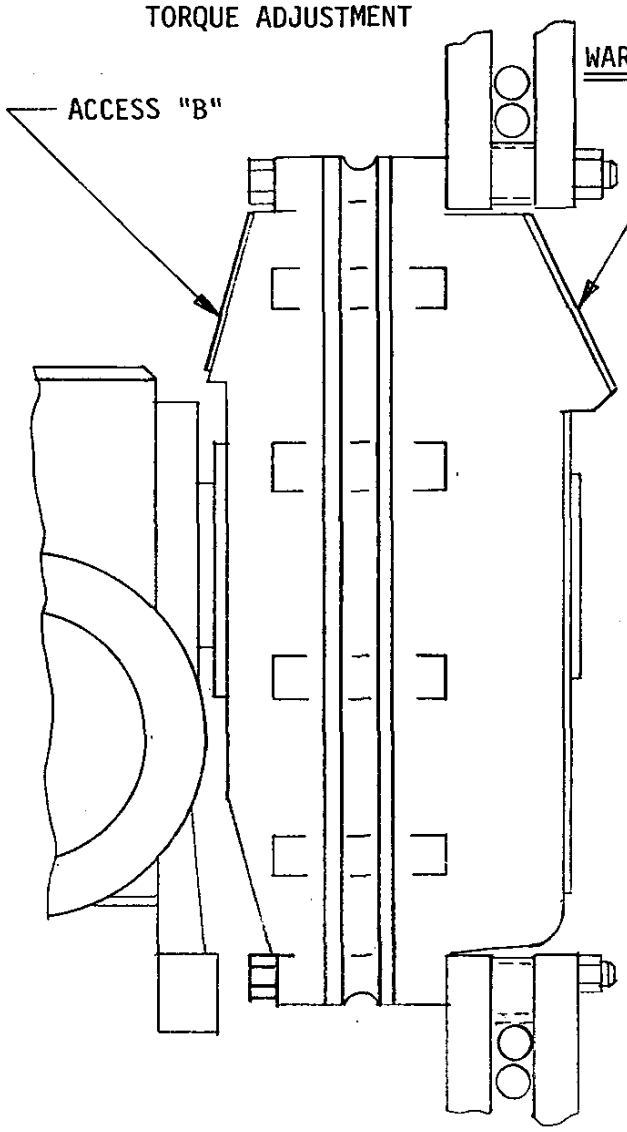


FIG. 3

1. Ensure reel is switched off at main switch.

2. Remove access cover "A" which is secured by five screws (Fig. 3).

3. Rotate the cable reel which is secured to the torque regulator outer casings OR energize the reel momentarily to bring the torque adjusting pinion opposite access "A" as shown in Fig. 4.

4. Insert the torque adjusting key (12mm or .5" square) in the square hole at the center of adjusting pinion.

WARNING: On Dual Power-Torq Series Reels both units must be adjusted equally.

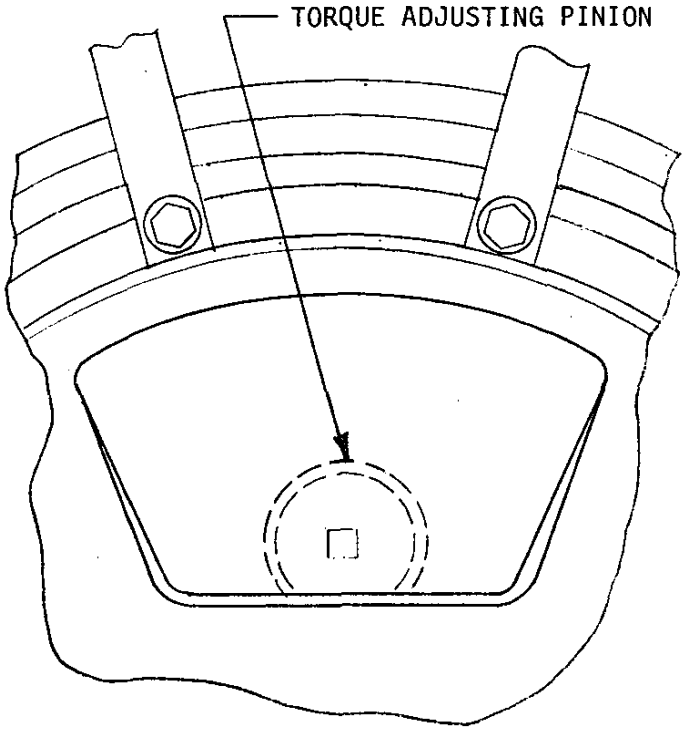


FIG. 4

5. Turn COUNTER CLOCKWISE to INCREASE torque or CLOCKWISE to REDUCE torque. The torque adjustment arrangements are self-locking. ALWAYS REMOVE THE ADJUSTING KEY BEFORE ENERGIZING THE REEL MOTOR OR ROTATING THE REEL.

6. IMPORTANT: Replace the access cover as soon as possible after adjustment, ensuring that the sealing gasket is in position. Foreign matter or moisture must not be allowed to enter the torque regulator.

FRICTION PAD REPLACEMENT

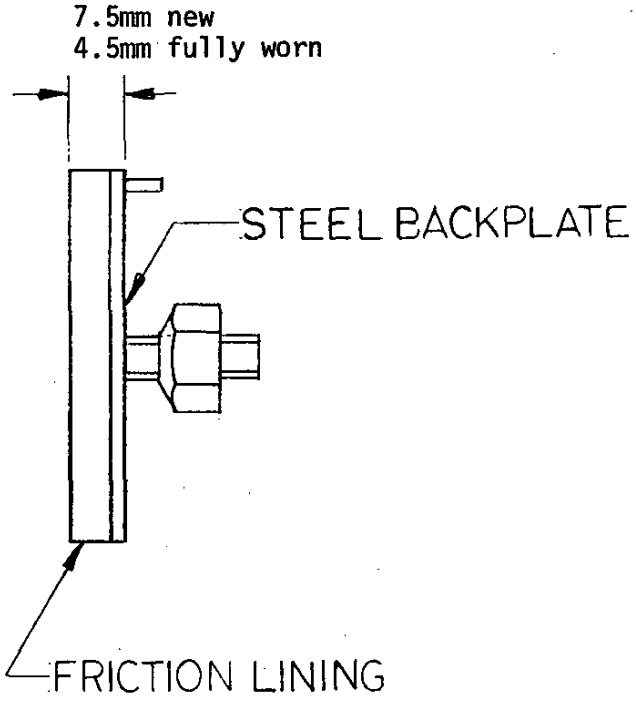


FIG. 5

The renewable friction pads within the torque regulator have been designed to give very long life, the extent of which will be dependent on torque setting and frequency of working. A yearly inspection of one random sample pad is recommended to assess wear rate (see Fig. 5 for pad thickness when new and fully worn).

Arrangements are made within the torque regulator to prevent the friction pads being worn down to their steel backplates, and if the friction pads remain in the torque regulator until fully worn, a rapid reduction in torque will result without damage to the torque regulator.

Performance will be fully restored when new pads are fitted. IN THE INTEREST OF SATISFACTORY CABLE REELING, HOWEVER, FRICTION PADS SHOULD BE RENEWED BEFORE BECOMING FULLY WORN.

To inspect a sample friction pad, remove access "A" (see Fig. 1) as described in the preceding section, and with the torque adjusting key, rotate the torque adjusting pinion CLOCKWISE until firm resistance is felt and then ROTATE TWO TURNS COUNTER CLOCKWISE BEFORE FURTHER WORK ON THE UNIT IS UNDERTAKEN.

If the number of clockwise turns on the torque adjusting pinion is recorded, then the same number of turns counter clockwise (taking into account the two turns counter clockwise called for above) will restore the original torque setting after the wear examination has been completed. This procedure would avoid the necessity to employ a spring balance to reset the torque. In many installations, it will be necessary to restrain the reel against unwanted rotation due to the subtended cable. Rotate the cable reel or momentarily energize the reel motor to bring one friction pad conveniently opposite access "A" (see Fig. 6). The friction pay may then be removed by loosening (counter clockwise) the coned locknut and sliding it towards the open end of the slot in which the particular friction pad is fitted. Replace the friction pad after examination and lock in position by moderately tightening the coned locknut. Reset the torque regulator to the desired setting and replace the access cover as described in the preceding section.

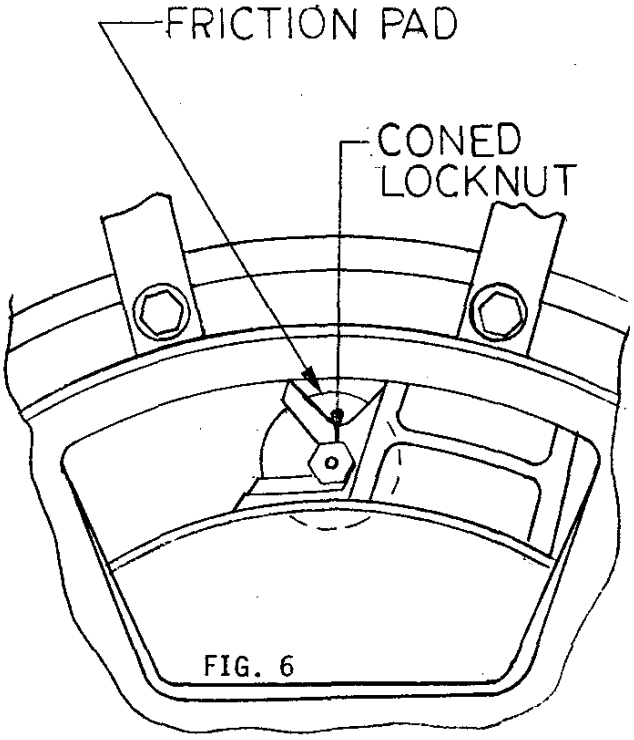


FIG. 6

Renewal of Friction Pads

1. Remove access covers "A" and "B" (see Fig. 1) both of which are secured by five screws.
2. Remove all pressure on the friction pads by rotating the torque adjusting pinion CLOCKWISE until firm resistance is felt and THEN ROTATE TWO TURNS COUNTER CLOCKWISE BEFORE FURTHER WORK ON THE UNIT IS UNDERTAKEN.
3. Remove all 12 friction pads (6 via access "A" and 6 via access "B") as described in the preceding section.
4. Rotate the cable reel to bring the accesses "A" and "B" to a conveniently low position and blow out the dust which has been abraided from the worn friction pads. (Note: It is preferable to wear a breathing mask and eye shield during this operation). After blowing out the dust, rotate the cable reel to bring the accesses "A" and "B" to a convenient position for fitting the replacement friction pads.
5. Fit 12 replacement friction pads and lock in position by moderately tightening the coned lock nuts.
6. Adjust the torque setting to the required value as described on Page 4. Remember to replace the access covers and their sealing gaskets as soon as possible.

Lubrication

The gearbox is factory filled with a synthetic lubricant and will normally require no further attention throughout its full working life.

As the gearbox contains a greater quantity of lubricant than that required, minor leakage from the gearbox, should this occur, can be ignored. Should, however, a leak in excess of 10 ml/week or in practical terms a full tea-spoonful/week occur, the unit should be given attention.

THE TORQUE REGULATOR MUST NOT, UNDER ANY CIRCUMSTANCES, BE LUBRICATED AS THIS MAY SERIOUSLY AFFECT ITS PERFORMANCE.

CAUTION: This unit has been factory set to match your torque requirements. If a slight amount of additional torque is required, follow the torque adjustment procedure on Page 7.

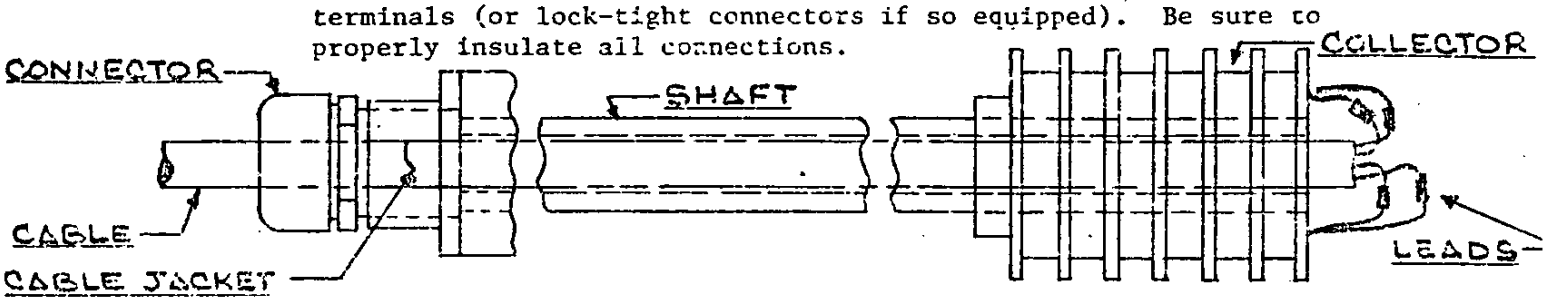
WARNING!!

If the torque adjusting pinion is tightened excessively, damage to motor or gearbox may result.

CABLE INSTALLATION INSTRUCTIONS FOR "C", "D" & "TR" REELS

I. WHEN REEL IS SUPPLIED WITH A COUPLING ENTRANCE ASSEMBLY

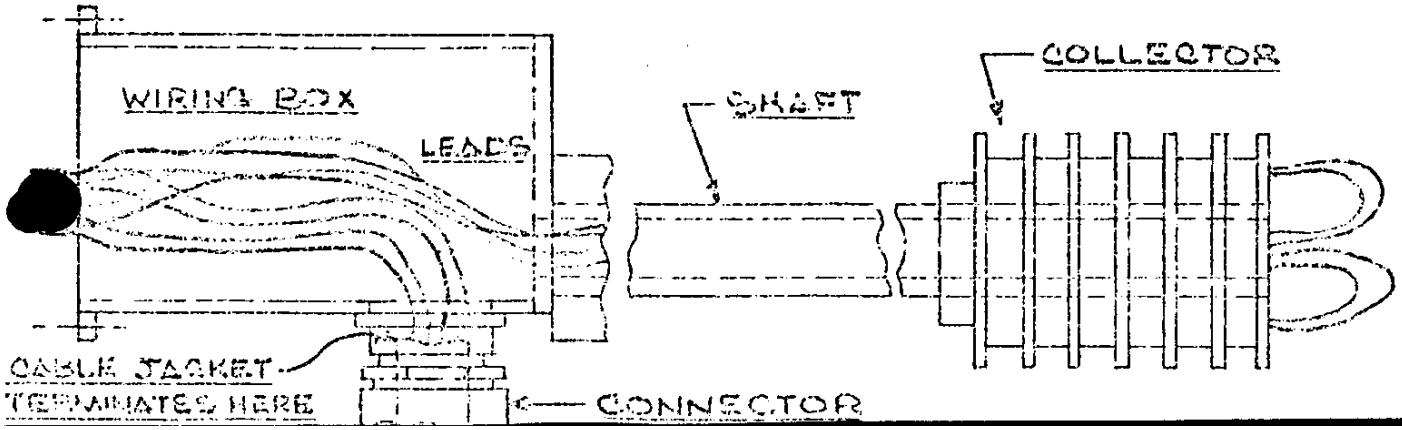
A. If cable diameter is less than the I.D. of the shaft, the cable may be passed thru the cable connector and shaft to the collector compartment. Allow sufficient lead length for connection to collector lead wire terminals (or lock-tight connectors if so equipped). Be sure to properly insulate all connections.

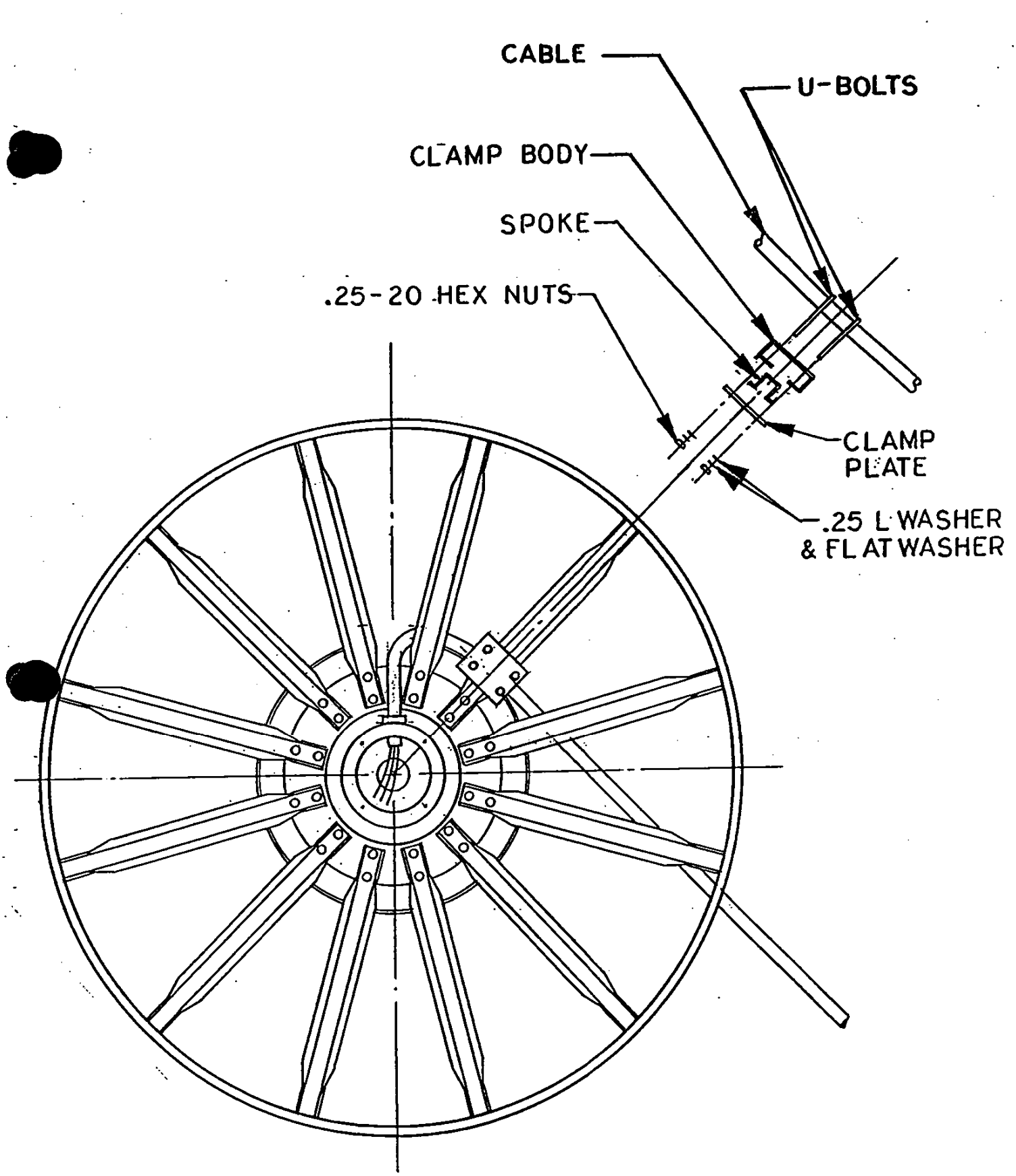


B. If cable diameter is greater than the I.D. of the shaft, determine the length of cable required to pass from the cable connector thru the shaft to the collector compartment. Allow sufficient lead length for connection to collector lead wire terminals (or lock-tight connectors if so equipped). Remove the outer insulating jacket from the cable at this length. Wrap electrical tape tightly around conductors at various points to prevent unravelling. This will provide easier insertion thru' shaft. Cable with jacket intact must be inserted into the neoprene bushing inside the cable connector for a secure and water-tight connection. Be sure to properly insulate all lead wire terminal connections.

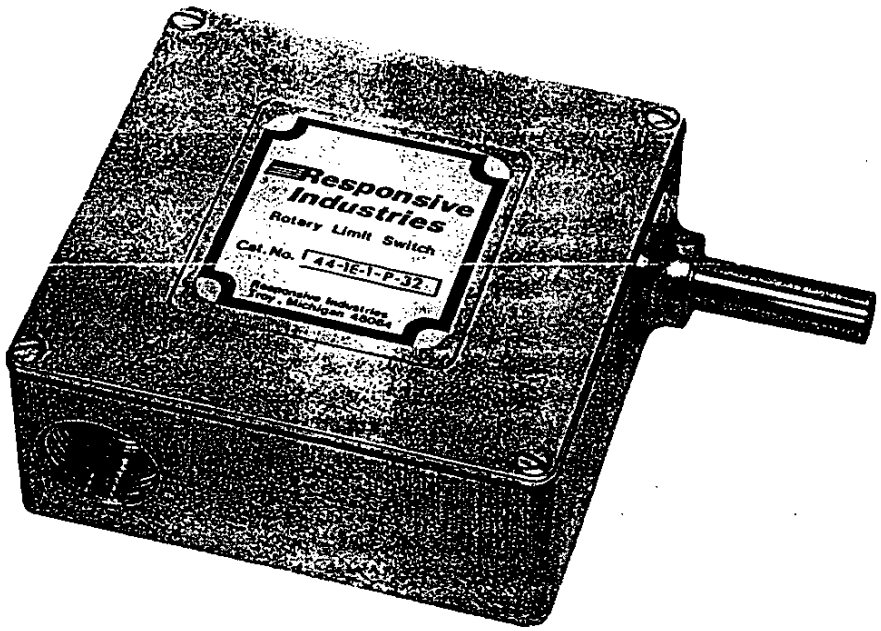
II. WHEN REEL IS SUPPLIED WITH A WIRING BOX ENTRANCE ASSEMBLY

Lead wires from the collector thru the shaft to the wiring box entrance are included with reel. Remove cover from wiring box entrance. Determine the length of cable required to pass from the cable connector thru the wiring box allowing sufficient leadwire length outside of box for connection to collector lead wire terminals. Remove the outer insulating jacket from the cable at this length. Insert cable thru connector into wiring box. Cable with jacket intact must be inserted into the neoprene bushing inside the cable connector for a secure and water-tight connection. Be sure to properly insulate all lead wire terminal connections.



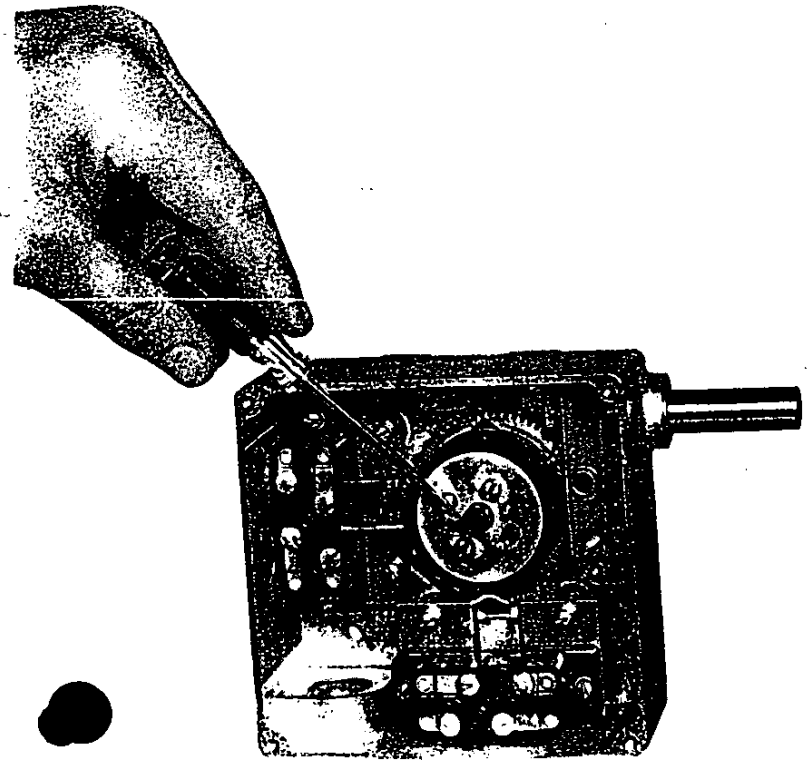

CABLE
U-BOLTS
CLAMP BODY
SPOKE
.25-20 HEX NUTS
CLAMP PLATE
.25 L WASHER & FLAT WASHER

OFF THE SHELF....IMMEDIATE DELIVERY ! !

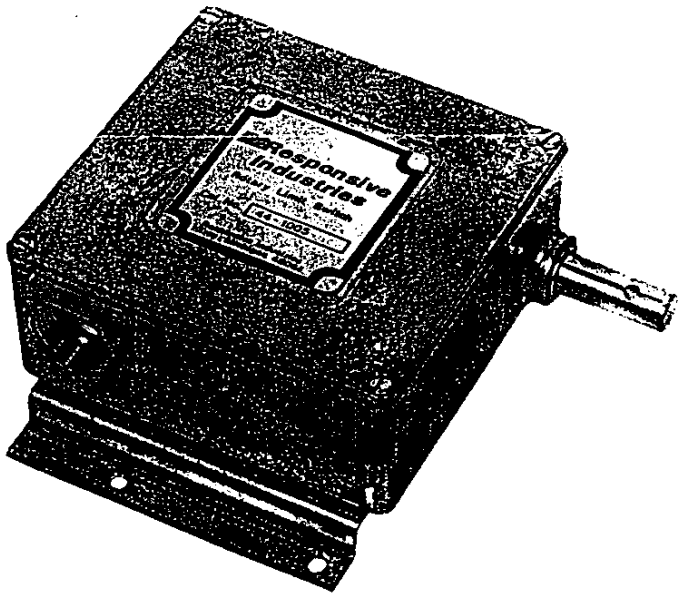


FEATURING

- CSA AND UL LISTED
- 600 VOLTS MAX. 15 AMP. CONT. AC/DC
- LONG LIFE — RUGGED DUTY DIE CAST ENCLOSURE AND STAINLESS STEEL INPUT SHAFT
- S.P.D.T., D.P.D.T. OR SLOW MAKE SLOW BREAK INDUSTRIAL DUTY SWITCHES WITH ISOLATED CONTACTS
- GEAR RATIOS FOR APPLICATIONS REQUIRING 1 TO 120 TURNS
- LARGE DIAMETER CAMS PROVIDE SUPERIOR RESOLUTION AND EASE OF PRECISE CAM SETTINGS
- SWITCH TERMINAL SCREWS EASILY ACCESSIBLE FOR WIRING



EASE OF WIRING INDUSTRIAL DUTY SWITCHES AND CAM ADJUSTMENT WITH STANDARD SCREWDRIVER



SPECIAL MOUNTING BRACKETS AND SHAFT EXTENSIONS TO MEET YOUR SPECIFIC REQUIREMENTS

APPLICATION — **Responsive Industries** Rotary Limit Switches are designed to control the limits of travel of rotating reversing equipment. Typical applications include control of travel on material handling equipment, hoists, cranes, valves, compacting equipment, machine tool lead screws, packaging machinery, powered doors, gates and windows and many other applications requiring end limits on reciprocating or rotary motion.

Catalog Section 44 Geared Rotary Limit Switches can be easily attached to a rotating shaft through a gear train, chain and sprocket, direct coupling etc. The large cover opening provides ease of wiring to **Industrial Duty UL and CSA Listed Switches.** Wiring of the switches and setting of the cams can be quickly accomplished with a standard screwdriver.

DESCRIPTION — **Responsive Industries** Rotary Limit Switches consist of two switchettes with **double — break silver contacts** mounted in a **sturdy die cast enclosure** and operated through a worm and gear reduction from a **stainless steel input shaft** extending outside the enclosure. A lower cam operates one switchette and the upper cam operates the second switchette.

Individual adjusting screws for each cam make it possible to operate the contacts on Rotary Limit Switches with 32:1 ratio, between a minimum of one (1) turn up to a maximum of 30 turns of the input shaft. Rotary Limit Switches with a 128:1 ratio operate the contacts between a minimum of four (4) up to a maximum of 120 turns of the input shaft. The maximum input speed is 600 rpm.

INSTALLATION — Remove all source of power. Mount the Geared Rotary Limit Switch in any desired position using the mounting holes provided in the enclosure. If the input shaft is to be used in conjunction with another shaft, a flexible coupling is recommended for elimination of stress on the input shaft. When using a chain and sprocket or gear, the shaft load should not exceed 5 lbs. Both plain shafts and Woodruff key shafts are available for ease in mounting most any type of coupling, chain or gear drive.

After the switch has been wired in accordance with the contact arrangement in the cover of the switch, adjust switch properly, fold down the insulating shield and replace the limit switch cover.

CAM ADJUSTMENT — The adjustment of the trip point of each of the switch units is a simple operation. The operating mechanism of the limit switch should be adjusted to correlate the motion of the equipment that it is controlling.

1. Remove all power from the device.
2. Remove the enclosure cover.
3. Loosen the two cam clamping screws on top of the cam assembly, ¼ turn each (See Fig. 1).
4. The light color pinion adjusts the cam of switch #1. The dark color pinion adjusts the cam of switch #2.
5. With a screwdriver, rotate the cams in the direction to operate each switch.
6. When the operating cam has been adjusted so the switch has been tripped, the adjustment is completed.
7. Retighten the clamp screws and replace the enclosure cover.

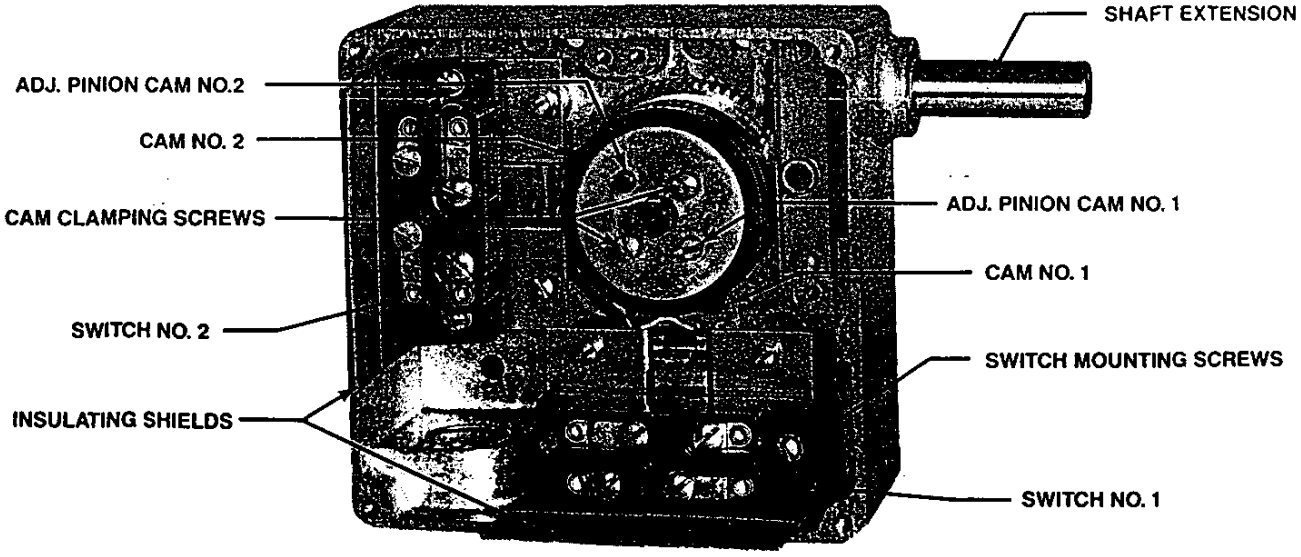


Figure 1

OFF THE SHELF....TWO CIRCUIT ROTARY LIMIT SWITCHES
CATALOG NUMBERING SYSTEM

44 — 1E — 1 — P — 128

- **44** — RESPONSIVE INDUSTRIES CATALOG SECTION
- **1E** — TWO CIRCUIT ENCLOSURE TYPE

	TWO CIRCUIT ENCLOSURE TYPE	LIST PRICE
1E	General Purpose NEMA 1, 12 and 13	
4E	Watertight NEMA 4	Consult Factory
7E	Hazardous Locations Class I, Groups C&D Class II, Groups E, F and G NEMA 7-9	Consult Factory

- **1** — SWITCH TYPE (Two Switches Per Ass'y.)

	SWITCH TYPE (Two Switches Per Ass'y.)	CONTACT ARRANGEMENT	LIST PRICE
1	S.P.D.T. Snap Action Switches	2 NC 2 NO	No Addition
2	D.P.D.T. Snap Action Switches	4 NC 4 NO	Add $16.00
4	Slow Make Slow Break *Quick Reset Switches	2 NC	No Addition

All switches have isolated contacts.
*Slow Make, Slow Break Switches are not recommended with D.C. circuits.

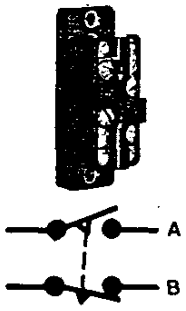
- **P** — SHAFT EXTENSION

	SHAFT EXTENSION
P	Std. with Plain End ½" Dia. x 1½" Long
W	Std. With #3 Woodruff Key, ½" Dia. x 1½" Long

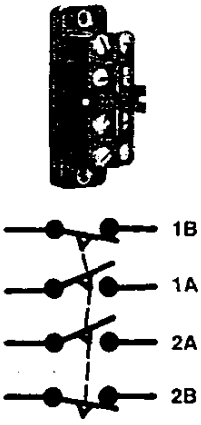
- **128** — GEAR RATIO / MAX. TURNS OF INPUT SHAFT

	GEAR RATIO	MAX. TURNS OF INPUT SHAFT
32	32:1	30
128	128:1	120

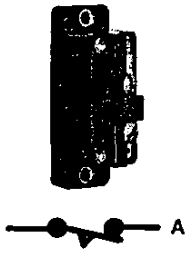
S.P.D.T.



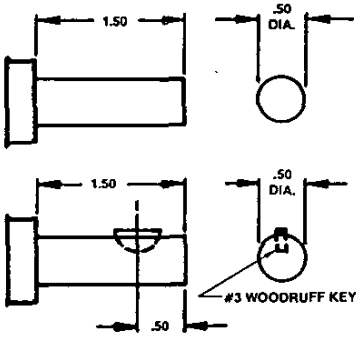
D.P.D.T.



Slow Make Slow Break



For use on A.C. Circuits requiring quick reset.



SHAFT EXTENSION
P
(Plain End)

W
(Woodruff Key)

Consult factory for special shaft extensions

Applications with a maximum range up to 30 turns, use 32:1 gear ratio.

Applications with a maximum range up to 120 turns, use 128:1 gear ratio.

Example: — A motor driven actuator rotates a total of 85 turns to open and close a damper door. The 128:1 Rotary Limit Switch would be used for this application.

SWITCH CONTACT RATINGS					
AC Pilot Duty			DC Pilot Duty		
S.P.D.T., D.P.D.T. and Slow Make Slow Break Switches			Slow Make Slow Break Switches are not recommended with DC circuits		
Volts	Break	Make	Volts	S.P.D.T.	D.P.D.T.
115	15 amp	40 amp	120	0.50 amp	0.25 amp
230	10 amp	20 amp	240	0.20 amp	0.1 amp
460	6 amp	10 amp	575	0.02 amp	—
575	5 amp	8 amp			

Switch Type	Gear Ratio	TURNS OF INPUT SHAFT To Trip Max.	To Trip Min.	To Reset	Over-Travel
S.P.D.T. D.P.D.T. Snap Acting	128:1	120	4	2½	5
	32:1	30	1	⅝	1
Slow Make Slow Break For Quick Reset	128:1	120	4	¼	5
	32:1	30	1	⅛	1

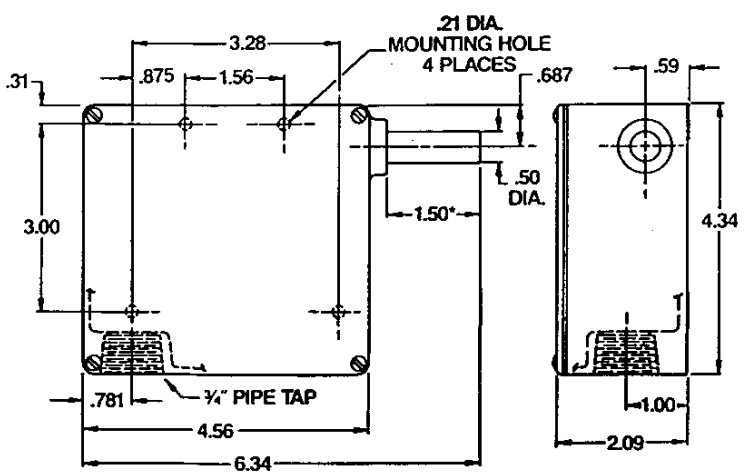
RESPONSIVE INDUSTRIES INC.
1352 J COMBERMERE
TROY, MICHIGAN 48084
313-589-1060

GEARED ROTARY LIMIT SWITCHES

	CATALOG NUMBER CROSS REFERENCE		
	GENERAL ELECTRIC CR9441 ROTARY LIMIT SWITCH	RESPONSIVE INDUSTRIES CATALOG NUMBER	GEAR RATIO
S.P.D.T. SWITCHES	CR9441 E1A	44-1E-1-P-128	128:1
	CR9441 E1B	44-1102	128:1
	CR9441 E1C	44-1103	128:1
	CR9441 E1D	44-1104	128:1
	CR9441 E1F	44-1E-1-P-32	32:1
	CR9441 E1G	44-1E-1-W-128	128:1
	CR9441 E1H	44-1E-1-W-32	32:1
	CR9441 E1J	44-1110	128:1
	CR9441 E1K	44-1111	128:1
	CR9441 E1L	44-1112	32:1
SLOW MAKE SLOW BREAK SWITCHES	CR9441 E4A	44-1E-4-P-128	128:1
	CR9441 E4B	44-1402	128:1
	CR9441 E4C	44-1403	128:1
	CR9441 E4D	44-1404	128:1
	CR9441 E4E	44-1405	32:1
	CR9441 E4F	44-1E-4-P-32	32:1
	CR9441 E4H	44-1E-4-W-32	32:1
	CR9441 E4J	44-1410	32:1
	CR9441 E4L	44-1412	128:1
	CR9441 E4M	44-1413	128:1
	CR9441 E4N	44-1414	32:1

Consult factory for catalog numbers not listed.

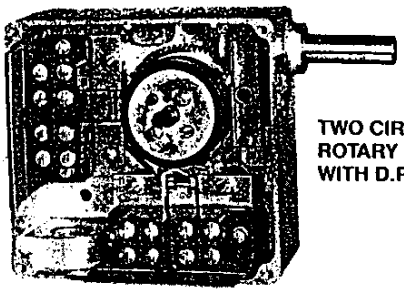
DIMENSION DRAWING



*2.06 AVAILABLE FROM STOCK

APPROX. SHIPPING WT. 7 LBS. EACH

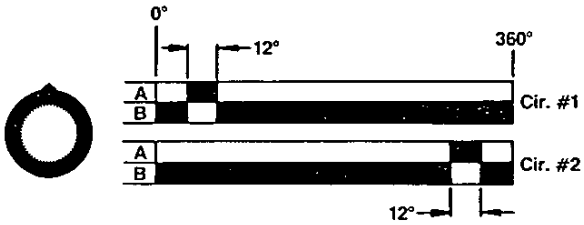
SPECIAL OPTIONS AND FEATURES



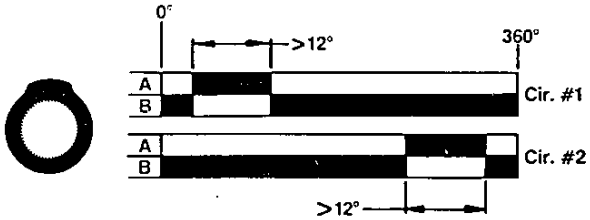
TWO CIRCUIT ROTARY LIMIT SWITCH WITH D.P.D.T. SWITCHES

SPECIAL CAMS FOR EXTENDED DWELLS

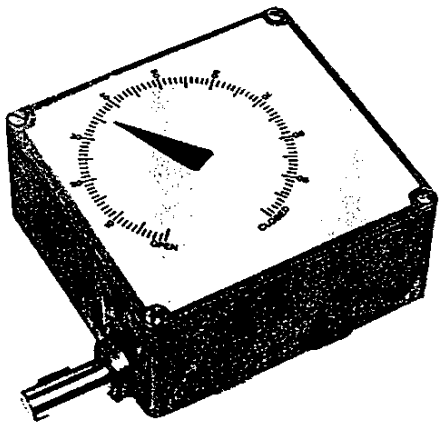
Some applications require an extended cam dwell to prevent reset of the switch due to excessive overtravel at an end stop. Special cams can be supplied with extended lobes as shown above. Specify the extended cam dwell in degrees required for your application.



STANDARD DWELL CAMS



EXTENDED DWELL CAMS



TWO CIRCUIT ROTARY LIMIT SWITCH WITH EXTERNAL POSITION INDICATOR

RESPONSIVE INDUSTRIES INC.
1352 J COMBERMERE
TROY, MICHIGAN 48084
313-589-1060

SERVICE MANUAL

FOR THE

LINTERN AIRE-RECTIFIER

☆

Crane Cab and Pulpit AIR CONDITIONER

MENTOR, OHIO 44060

THE LINTERN CORPORATION

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MENTOR, OHIO 44060
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(Cont'd on Inside Back Cover)

LINTERN CRANE CAB and PULPIT AIRE-RECTIFIER SERVICE MANUAL

WARRANTY

THE LINTERN AIRE-RECTIFIER is guaranteed free from mechanical and electrical defects for a period of one year from date of shipment. Our liability, under this guarantee, is limited to repair or replacement of defective parts, f.o.b. Mentor, Ohio. There is no liability under this guarantee beyond the cost of correcting defects in the apparatus supplied by the Lintern Corporation.

We are not responsible for damage resulting from incorrect installation, maintenance, or attempts to operate at above rated capacity, or on excessive or low voltage. Crane cabs and pulpits must be of an approved size, and insulated in accordance with instructions, or warranty does not apply. Upon having been installed and wired (by the purchaser), our refrigeration engineer will install the refrigerant lines between the condenser section and cooling section and start the machine in operation. The above warranty only applies if he makes the connections and starts the unit in operation, or connection by the customer is approved in writing.

CUSTOMER FIELD TECHNICIAN

Our customer field technicians are available to visit your plant and put the equipment into operation, after it has been properly installed and wired. The technician's rate will be quoted upon request. At least fourteen days notice is required as to when service of the customer field technician will be needed. Where possible, our technicians are instructed to observe the operation of a newly installed machine through a period of at least twenty-four hours. We should only be notified when in-

stallation is complete. The cab or pulpit should be enclosed and insulated in accordance with our recommendations.

The original charge of refrigerant is included in your purchase price, and should leaks develop during the run-in period, our technician will replace the refrigerant without cost.

IMPORTANT — Notes on Operation and Service

The Lintern Aire-Rectifier refrigeration system (using the refrigerant R-12, R-114 and 60/40) is designed for operation in ambient temperatures not lower than 80° F. Attempts to force-run the machine at temperatures lower than 80° F. causes liquid to enter the compressor body, which removes oil film on bearings and cylinder walls with immediate damage resulting.

The Lintern Aire-Rectifier is a carefully engineered and ruggedly built machine. Each model is designed to fit particular conditions, and will produce cooling or heating of the air as required, holding the proper temperature within narrow limits. Each part of your Aire-Rectifier is the best available, and becomes a part of the equipment only after thorough testing clearly demonstrates that the part meets our high standard of ruggedness and dependability.

The Lintern Aire-Rectifier is built to provide many years of uninterrupted service **if a proper program of preventive maintenance is employed,** as is customary with all machine tools and equipment contributing toward productive output. Inspections are required at regular intervals by someone competent to employ corrective measures when necessary. All machines are thoroughly run-in at our factory. During the running-in period, all parts of the machine are carefully checked and balanced.

In plants where a special department is maintained for servicing water coolers and general air conditioning equipment, servicing of the Lintern Aire-Rectifier can be handled by that particular department by referring to instructions contained in this manual.

In plants where there is no one familiar with refrigeration or cooling systems, the mechanical and electrical departments can service motors, controls and filters. Should difficulty develop in the refrigeration circuit, we suggest that a local refrigeration service man be employed to check and correct the trouble, at least until the existing departments have an opportunity to study and become familiar with the equipment.

This manual should be studied thoroughly before servicing is attempted.

MACHINE DESCRIPTION

The Lintern Aire-Rectifier is a "Split System" type. For crane cabs the condensing section is of the air cooled type and is mounted on the bridge footwalk or trolley platform when the operator's cab is integral with trolley structure. When applied to pulpits, air and water cooled condensers are available and are mounted on the mill floor adjacent to the pulpit or on platforms at pulpit level. The filtering and cooling section(s) are located within, or on, the operator's cab or pulpit enclosure, the two being interconnected by flexible refrigerant lines.

The condenser section contains the compressor, compressor motor, condenser coil, condenser fan or blower, oil separator, receiver, pressure gauges, strainer and dehydrator, auxiliary switch and pressure switches.

The filtering and cooling section contains the cooling coil, expansion valve, circulating fan or blower, mechanical air filter, Purafil air filter and electric heater units. Heating and cooling thermostats and selector switch are in a separate pilot control, to be located in the cab or pulpit. Machine control is located in a separate compartment.

CONDITIONED AIR SUPPLY

The cab air is first drawn through the mechanical filter, which removes dust and dirt, then through the Purafil filter, which removes gas and odors. It is then drawn over the evaporator coil, where it is cooled and

dehumidified, and is discharged into the crane cab or pulpit. Make up air is also drawn through the filters in the same way.

Filters — Mechanical Type

THE LINTERN AIRE-RECTIFIER is equipped with a mechanical air filter for removing industrial dirt from the air. These are required for protecting the equipment, as well as providing dust-free air to the cab or pulpit. The machine should never be operated without having the filter in place. They will require a periodic check; under ordinary industrial conditions, every seven days.

A separate set of filters is recommended for replacement while the original set is being cleaned.

If the air conditioner is operated with the mechanical air filter plugged with dust, the quantity of air passing through the evaporator coil will be greatly reduced and the evaporator coil will freeze solid resulting in serious damage. In the event that the machine is operated without filters, the evaporator coil becomes covered with dirt, and does not operate efficiently, resulting in increased wear of the fan motor and condenser motor.

How to Clean Filters

The mechanical air filter is cleaned by removing it from the unit and holding it under a water faucet until clean, or dipping in a pan of water. The dirt and lint float out of the media. A gentle up and down motion while in the water dislodges any stubborn dirt. After this immersion it is only necessary to drain the excess water from it before it can be returned to service. No drying time is needed.

In cases where a large amount of oil or grease has been picked up, it is advisable to use a mild household detergent in the water. This detergent should then be thoroughly rinsed from the filter before it is returned to service.

Mechanical filters may be cleaned over and over again without loss of efficiency. Do not oil this type of filter.

Activated Carbon & Pur-A-Fil

Activated carbon or Pur-A-Fil is furnished in the Lintern Aire-rectifier where conditions require reduction of certain gases in the air conditioned area. The life of the carbon or Pur-A-Fil is contingent on the gas concentration, which controls the periods at which it is necessary to replace the media.

REFRIGERATION CIRCUIT

The liquid refrigerant is stored in the receiver. On leaving the receiver it passes through the liquid line through the combination strainer-dehydrator to remove any dirt particles and also to remove any moisture from the liquid refrigerant, and then to the expansion valve. The expansion valve separates the high pressure section of the system from the low pressure section. It is actually nothing more than a needle valve, and acts as a pressure reducing valve because it lowers the pressure of the liquid flowing through it. The valve is adjusted so that only as much liquid can pass through it as can be vaporized by the cooling coil. The liquid then flows through the evaporator coil, where it is vaporized by the heat flowing through the walls of the evaporator coil tubing to the air. This heat has been transferred from the air flowing over the evaporator coil.

After leaving the evaporator coil, the vaporized refrigerant flows to the compressor, where the pressure is raised to such a point that the vapor can be condensed by the air of ambient temperature passing over the conden-

ser coil. After it is compressed, the vapor flows through the oil separator (on air cooled units only), where entrained oil is removed and returned to the compressor. The oil-free vapor then flows to the condenser coil where the latent heat from the condensing vapor is transferred through the walls of the condenser tubing to the air or water passing over the condenser coil.

From the condenser coil liquid flows back to the receiver, and the cycle is then repeated.

COMPRESSOR

Special Characteristics of Oil to be Used in Compressor

Higher operating temperatures have brought about a need for new refrigeration oil.

To meet the need for a refrigeration oil that will withstand higher than average temperatures, Texaco Oil Company developed Capella WF-68 Refrigeration Oil. This oil is Paraffinic type oil containing an oxidation inhibitor to make it more stable thermally. It is especially fortified to prevent the formation of gums and varnish, and will provide superior lubrication.

SPECIFICATIONS

TEXACO CAPELLA	Viscosity at 100° F.	V.I. Min.	Flow Test °F. (Max.)	Pour Test °F. (Max.)	Dielectric Strength KV Min.
WF-68	334	46	0	—35	25

We recommend changing oil in high ambient installations at least 4 times a year. Under no circumstances should oil of any kind other than that meeting the required specifications be used. Otherwise warranty will not apply. Oil must be kept in a sealed container, as oil will absorb harmful moisture quickly, on exposure to the air.

Belts

Compressor belts are matched in sets at the factory, and should replacement become necessary, all should be replaced at one time. The V belt drive need not be tight to be efficient. Belts adjusted too tightly cause undue wear on the belts, as well as on the motor and compressor bearings. A maximum total deflection of one inch with light hand pressure is found to be most satisfactory. Belt dressings should never be used.

Evaporator Coil

The evaporator coil is of special design and must be kept clean to insure efficient operation. No difficulty will be experienced in keeping it clean, providing the filters are used at all times.

Expansion Valve

The expansion valve is of the thermostatic type. While most valves are adjustable within narrow limits, no adjustment should be made except by persons familiar with the valve design. All Lintern units leave the factory with the expansion valve properly adjusted, and it is seldom necessary to alter this adjustment in the field.

Care must be taken to protect the capillary tubing from abrasion and dents, which would result in either line restriction or a leak, causing the system to become inoperative.

The thermal type expansion valve is actuated by the temperature and pressure of the refrigerant vapor leaving the evaporator coil. It does not respond to either the pressure or temperature alone, but by a combination of the two, which in effect results in the valve responding only to the superheat of the vapor leaving the evaporator.

If the valve is adjusted to maintain the vapor at a given superheat, it will open and admit more liquid only if the superheat is greater than the amount that it is adjusted to maintain. If the superheat is less, it will restrict the flow of the liquid to the coil.

The main function of the expansion valve is to admit as much liquid as possible to the evaporator without permitting any liquid to return to the compressor. Adjustment of the expansion valve used on the LINTERN AIRE-RECTIFIER is made by turning the adjusting stem in a clockwise rotation to increase the amount of superheat, which decreases the amount of refrigerant entering the coil; and counter clockwise to decrease the amount of superheat, which allows more refrigerant to enter the coil.

Dehydrator

Presence of moisture in refrigeration lines constitutes a harmful condition, and will result in numerous irregular operating characteristics that are often difficult to identify. Removal of moisture is accomplished by the use of a dehydrator. The dehydrator is of the molded type, and cannot disintegrate into the system.

If, for any reason, the lines are open or broken, a new dehydrator should be placed in the lines, unless you can be definitely certain that the one in the line has sufficient remaining capacity to completely dehydrate the entire circuit. A spare dehydrator should be kept on hand at all times.

Strainer

The strainer is a very fine screen consisting of felt and cotton waste, placed in the line to assure removal of all impurities. As the orifice of the expansion valve is very small, it is necessary for proper functioning to be certain that travel of any foreign material or impurities be arrested before reaching the valve.

NOTE: MOST AIR CONDITIONERS ARE EQUIPPED WITH A COMBINATION STRAINER-DEHYDRATOR. (BOTH ARE ENCLOSED IN ONE SHELL.)

Receiver

The receiver is of heavy electric welded steel construction, equipped with two single acting valves. It is fitted with a fusible blow-out plug to provide a safety factor in cases of over heating.

Gauges

Machines are equipped with gauges installed so as to be visible without removing the service panels for both the high and low side of the refrigerant circuit. A charging manifold is so located that refrigerant can be added without removing the panels.

Extremely humid air conditions will tend to increase suction pressures slightly, while dry air conditions will lower them slightly.

Condenser Coil

The condenser coil ordinarily will require no attention other than cleaning with an air hose at varying intervals.

Oil Separator (Optional)

The function of the oil separator is to prevent the oil from the compressor from entering the system, and to maintain an adequate oil level in the compressor.

The oil-laden gas leaving the compressor enters the separator at a high velocity and passes through a tubular fine mesh screen. The velocity of the gas is reduced, which causes the oil to precipitate on the screen and settle to the bottom of the separator. The oil-free vapor then flows to the condenser coil.

After sufficient oil has accumulated in the separator, a float valve opens and returns the oil to the compressor crankcase. The return of the oil is accomplished by a pressure differential, the oil in the separator is under the high pressure of the high side, and the oil in the crankcase of the compressor is under the low pressure of the low side.

A sufficient quantity of oil is in the separator at all times to prevent by-passing of gas between the high side and the low side.

Condenser Section Motor and Fan or Blower (Air Cooled Units)

The condenser fan draws or blows air through the condenser coil, thus cooling the refrigerant.

The fan or blower should be checked at intervals for tightness on the motor shaft; the motor should be lubricated, and the motor brushes should be inspected at periodic intervals.

Fan blades and blower cups should be kept clean. Excess accumulation of dirt on the blades will cause unbalance, which results in vibration.

Cooling Section Motor and Fan or Blower

The circulating fan or blower circulates the cooled air in the cab or pulpit. It is necessary to maintain clean filters to provide a satisfactory flow of air at all times.

The fan or blower should be checked at intervals for tightness on the motor shaft, the motor should be lubricated, and the motor brushes should be inspected at periodic intervals.

Fan blades and blower cups should be kept clean. Excess accumulation of dirt on the blades will cause unbalance, which results in severe vibration.

ELECTRICAL CIRCUIT

All motors are controlled by magnetic starters or contactors, and are protected by thermal overload relays.

The selector switch and thermostats have no direct electrical connection with the motors, but operate the coils of the magnetic starters or contactors only.

The control circuit contacts of all of the overload relays are connected in series so that if any one of the relays should trip, the entire machine is shut down.

The condenser section motor is controlled by the cooling thermostat. The cooling section motor is controlled by

the selector switch. It operates whenever the selector switch is in the "cooling" position. It is not operated by either thermostat.

The operating coil of the heater contactor is controlled by the heater thermostat on the pilot control and an overheat thermostat mounted adjacent to the heaters in the cooling section. It is so interlocked with the cooling section motor starter that should the cooling section motor starter open, the heater contactor will open. The overheat thermostat will prevent damage to equipment caused by reduced air movement over electric heaters by opening the heater contactor.

Turning the knob of the selector switch to the "cooling" position starts the cooling section motor, and if the temperature in the cab or pulpit is above the setting of the cooling thermostat, it also starts the condenser section motor.

The condenser section motor will operate until the temperature in the cab drops to approximately 2° below the setting of the cooling thermostat, causing the thermostat to open, stopping the condenser section motor.

The cooling section motor will continue to operate.

Turning the knob of the selector switch to the "heating" position, starts the cooling section motor, closes the heater contactor, if the temperature in the cab or pulpit is below the setting of the heater thermostat.

The heater will operate until the temperature in the cab or pulpit rises to approximately 2° F. above the setting on the heater thermostat, causing the thermostat to open, and shutting off the heater and cooling section motor.

Control Panel — 230 Volts D.C.

Each motor is protected with a separate starter which is mounted on the control panel. The starters are of the magnetic type equipped with overload relays. The condenser section motor starter is controlled by the cooling

thermostat. The cooling section fan or blower motor starter is controlled by the selector switch. The cooling section motor operates in the "cooling" position. The heating elements for the heating cycle, are energized by means of a contactor which in turn, is controlled by the selector switch. The heating contactor is interlocked with the cooling section fan or blower starter overload so that if the cooling section motor overload trips the heating contactor will open.

The control panel is equipped with two main fuses, which are ahead of all the controls.

The controls must be inspected at intervals for pitted and dirty contacts, and resistance to pivoting movement of the moveable contact.

All condenser units are equipped with pressure control which prevents the machine from operating in ranges not suitable for its efficient operation.

Control Panel — 440 Volts A.C.

On voltages above 220 volts a transformer is used to provide 110 volts for the control circuit.

The principle of operation is identical to that already described for 230 volts direct current operation.

Electric Heater (For Winter Operation)

Satisfactory operation of the electric heater depends on maintenance of the desired air flow at all times in winter operation. The heaters are rugged, enclosed in a high temperature metal sheath, and finned for efficient heat transfer.

HEAD PRESSURE CHART FOR R-114

Ambient Temp. °F.	Head Pressure PSIG	Ambient Temp. °F.	Head Pressure PSIG
60	19	96	45.00
62	19.5	98	46.85
64	20.75	100	48.74
66	22	102	50.67
68	23	104	52.65
70	24.5	106	54.67
72	26	108	56.73
74	27.32	110	58.84
76	28.75	112	60.99
78	30.2	114	63.20
80	31.69	116	65.45
82	33.22	118	67.74
84	34.78	120	70.09
86	36.39	130	85.00
88	38.03	140	100.00
90	39.71	150	125.00
92	41.44	160	137.00
94	43.20	170	145.00

NOTE: This chart serves as a part of **Lintern Crane Cab and Pulpit Aire-Rectifier Servce Manual.**

HEAD PRESSURE CHART FOR R-12

Ambient	Head Pressure PSIG
70	100
75	109
80	118
85	127
90	136
95	147
100	158
105	169
110	181
115	194
120	207
125	220
130	235
135	250
140	265

HEAD PRESSURE CHART FOR 60/40

Ambient Temp. °F	Head Pressure PSIG	Ambient Temp. °F	Head Pressure PSIG
70	85	125	162
75	90	130	173
80	95	135	185
85	101	140	200
90	106	145	212
95	111	150	227
100	117	155	243
105	124	160	260
110	132	165	279
115	141	170	300
120	152		

The primary factor governing the selection of refrigerant to be used is the head pressure at the maximum ambient temperature for which the air conditioner is designed, its low temperature also being important for satisfactory operation.

It should be made clear that a refrigerant other than that for which the air conditioner is designed positively should not be used. Each machine is marked (at the condenser) with the proper refrigerant.

In this manual reference is made to the cooling section, that which performs the actual cooling of the air within the crane cab or pulpit; and to the condenser section, that which serves to drive off the heat absorbed by the refrigerant in the process of cooling the crane cab or pulpit air.

LOCATION OF EQUIPMENT

Condenser Unit

On general purpose type cranes, the condenser unit is generally located on the bridge footwalk, either adjacent to or directly over the main drive shaft.

The condenser unit must be positioned so that the service side is accessible for servicing the unit (See dimensional print).

On ladle cranes, it is usually possible to locate the condenser unit on top of the cab. If the area on top of the cab is enclosed, adequate openings must be provided to allow the flow of air around the condenser unit. If there are resistors within the area, they must either be removed, or the condenser unit located elsewhere.

The condenser unit cannot be located in an enclosed compartment. As the largest size condenser unit generates a sufficient amount of heat to heat the average size two bedroom house, it can be readily seen that an adequate amount of air must be allowed to circulate around the condenser unit at all times if satisfactory performance is to be obtained.

The condenser unit should be mounted as high as possible on soaking pit and stripper cranes, away from the intense heat. The unit is usually mounted on top of the trolley. If it is necessary that the unit be located adjacent to the ram cage, a heat shield must be provided between the ram cage and the unit to prevent the upward air blast from the pit from passing over the condenser coil. The unit must not be located next to resistor banks or in an enclosed compartment, and it must be protected from direct radiant heat.

The unit should be so positioned that the service side is accessible for servicing the unit.

Cab Unit

The cab unit can usually be positioned against the wall of the crane cab, allowing a minimum of 18″ in front of the unit for servicing, or it may be located at ceiling level. A clearance of 12″ is recommended for connecting the refrigerant lines.

Wiring

No internal wiring is required.

Wiring between the units should be in accordance with our wiring diagram.

A wiring diagram is furnished with each machine in the control enclosure. A fused disconnect switch of the proper size must be furnished by the user.

Check Wiring:

After wiring has been completed, it is necessary to check motor rotations, and also to make certain that the controls operate satisfactorily.

On D.C. machines, proper rotation is set at the factory.

The following procedure is recommended for checking the wiring:

1. Set cooling thermostat 5° below cab or pulpit temperature.

2. Set heating thermostat 5° above cab or pulpit temperature.
3. Set selector switch to "off" position.
4. Close fused safety switch (furnished by customer).
5. Turn selector switch to "cooling" position. At this point the cooling section motor and condenser section motor should run.
6. Turn selector switch to "heating" position. At this point heaters and cooling section motor should operate. Allow a minimum of 5 minutes for heater to warm up.
7. Turn selector switch to "off" position, and open fused safety switch.

REFRIGERANT LINE HOOK-UP PROCEDURE

1. Determine the shortest and easiest way to run lines where they will be as much in the clear as possible and where they can be solidly anchored.
2. Cut 2⅜" diameter hole in cab or pulpit wall or ceiling.
3. Cut a 1-29/32" diameter hole.
4. Measure correct length of lines, cut to length and move fitting. Assemble fittings.
5. Use a cut-off wheel or hack saw in cutting lines to length. Cut as square as possible to fit flush fitting.
6. After fittings are in place, run lines and secure lines with clamps furnished. Finish off holes in cab or pulpit with Duxseal provided, forming Duxseal around and between hose and metal. The unit is now ready to be purged.
7. To purge, open dip tube valve on receiver. It is the receiver outlet valve. Just open, then close right away. Close high side valve all the way. (Refer to

illustration—Service Shut-Off Valves—Page 19). Open low side valve one to two turns. Leave open and purge off at low side on charging manifold.

8. Turn pilot control switch to "cooling." Turn on auxiliary switch, compressor motor should run. Turn auxiliary switch off. Pull main disconnect switch. Open receiver tank valves. Unit is ready to run. Run unit with panels off for a short time and check for leaks.

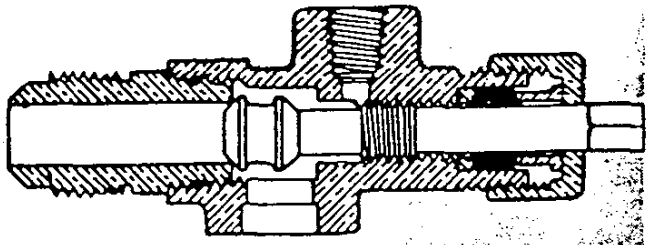
SERVICE SHUT-OFF VALVES

Lintern Aire-Rectifier

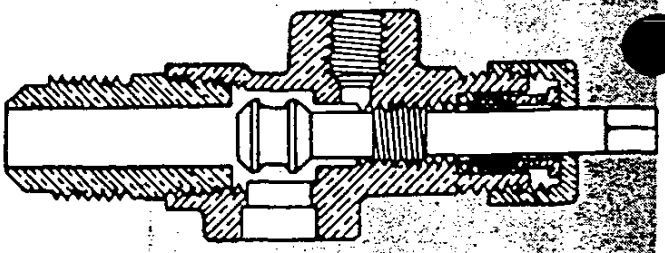
Units are equipped with shut-off valves as illustrated.

They are a double seating valve with a port opening to allow pressure gauge attachment.

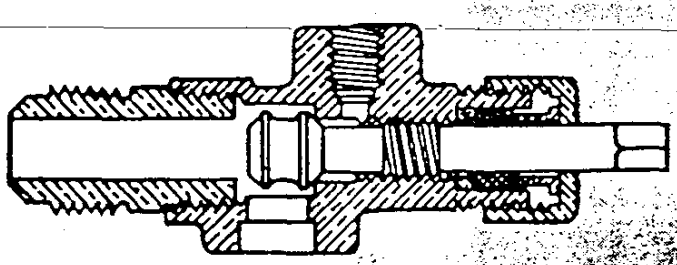
The purpose of these are to isolate compressor from the system, when conditions require.



VALVE STEM CLOSED, WITH GAUGE PORT OPEN



VALVE STEM TURNED OFF SEAT, BOTH PASSAGES AND GAUGE PORT OPEN



VALVE IN NORMAL OPERATING POSITION STEM OUT LONG

AC-122656

MACHINE START UP PROCEDURE

After refrigerant lines are installed, the joints should be checked for leaks in the following manner.

1. Open suction service valve on compressor; leave gauge port open.
2. Crack receiver outlet valve until suction pressure gauge on compressor reads 10 lbs.; then close.
3. Check all connections with Halide leak detector.

After installation has been checked for leaks:

1. Open compressor discharge and suction service valves; leave gauge ports open; open receiver valves.
2. Closed fused safety switch, (furnished by customer), and turn selector switch knob to "cooling", to start machine (make certain the cooling thermostat is set below the cab temperature so that the thermostat contact points are in the closed position.)

When the compressor is first started, there may be severe knocking. This is due to boiling liquid refrigerant that has become mixed with the oil in the crankcase. Shut off the compressor and then start again, allowing it to run for 5 second intervals until knocking disappears.

Allow the machine to run for approximately one-half hour. It will now be necessary to purge the system of air. Use the following procedure:

1. Turn selector switch to "off" position, stopping machine.
2. Open high side on charging manifold, or preferably the purge valve on the condenser coil inlet manifold, allowing vapor to escape. If there is any air present, the vapor will feel hot and will gradually cool as the air is replaced by refrigerant gas. A small amount of oil is present in the escaping vapor at all times. Check level on Oil Level Sight Glass of compressor.
3. When vapor begins to feel noticeably cooler, close High Side Manifold Port.

4. Start the machine and observe its operation. Repeat the above operation if necessary, after the machine operates for approximately one-half hour.

The foregoing operation should not be attempted by anyone untrained in refrigeration work. It is possible to purge the machine to such an extent that sufficient refrigerant would be lost to cause a shortage in the system. Also, it is possible that enough air would be allowed to remain in the system to cause damage. After the system has been purged, the machine is ready for operation.

Thermostats should be set at a desired cab or pulpit temperature. Practice has proven that a setting between 80° and 85° for the cooling thermostat, and between 70° and 75° for the heating thermostat is satisfactory.

During the first day of operation, the system should be checked periodically for leaks that may develop at the "Hose-Lok" Fittings.

At any point where the refrigerant lines may be bumped or walked on, a metal shield should be provided to prevent damage to these lines.

If the refrigerant lines are exposed to radiant heat, a heat shield should be provided between the radiant heat source and the lines.

At the points where the lines pass through the cab walls, they should be protected from chafing.

Possible Causes of Operating Difficulties

We list below the possible cause of operating difficulties in the refrigeration circuit.

One or more of these may apply at the same time, and it is well for the maintenance man to check step by step each of these conditions when difficulties develop. At this point it is best to be clear that suction pressure is a direct indicator of cooling load on low side of refrigerant sys-

tem. During normal operation at 80°F. D.B. inlet air in cab or pulpit results in a 35 to 40 PSIG suction pressure on all air conditioning unts charged with R-12 refrigerant. Air conditioning machines charged with R-114 will vary between 2 PSIG to 5" of vacuum suction pressure. 60/40 suction pressures will vary between 6 to 16 PSIG.

The above are normal ranges and of course will vary up or down with changes of D.B. temperature inlet, W.B. temperature inlet, head pressure, compressor wear, gauge error.

1. Shortage of Refrigerant

Shortage of refrigerant will cause the machines to cycle continuously with little cooling effect. The evaporator coil tubes will be very uneven in temperature, with the tubes at the entering air face very warm. Low head and suction pressure are an indication.

To Correct This Condition

(a) Check all the tube joints for leaks with a Halide torch.

(b) Check all compressor fittings. Tighten if necessary.

(c) Check packing glands on service valves. Tighten just enough to stop leak.

(d) Check shaft seal at flywheel end of drive shaft with Halide torch. Replace seal if necessary.

(e) Check compressor gaskets. Head and crankcase studs may need tightening.

To Charge Unit

(a) Remove Dust Cap from charging manifold.

(b) Connect refrigerant drum to charging manifold.

(c) Purge charging line.

(d) Turn low side service valve in one to two turns.

(e) Turn condenser compressor motor on.

(f) Crack low side valve on charging manifold and charge.

To determine when full charge has been obtained, consult pressure temperature relation chart and charge until

pressures corresponding to your ambient temperatures have been reached. The sight glass in liquid line should indicate clear refrigerant and be completely full. The suction line should feel cool to the touch at the compressor.

2. Obstruction in Liquid Line

(See Refrigeration Circuit Diagram — Page 28).

Obstruction in liquid line will cause the liquid line to feel cool at the point of obstruction.

If head pressure reads normal, and suction pressure reads lower than normal, it is indication of a restriction. This restriction is most generally found in the strainer, dehydrator, or the expansion valve. Make certain both receiver valves are open.

To determine whether the strainer or dehydrator is restricted, place one hand on the liquid line at the receiver side of the strainer, and the other hand on the expansion valve side of the dehydrator line. The slightest difference in temperature at these two points will indicate a restriction serious enough to interfere with the cooling operation of the unit. If any temperature difference is noted at these points, use the recommended pump-down procedure for removing strainer and dehydrator, and replace these units.

To Correct This Condition

(a) Make certain that the receiver outlet valve is in full open position.

(b) Inspect liquid line for dents or pinches. Replace if necessary.

(c) Inspect line strainer; filter screen may be clogged. If strainer has a removable filter, wash it with carbon tetrachloride, otherwise replace it with a new strainer. (Most units are equipped with a combination strainer - dehydrator, both enclosed within one shell.)

(d) Inspect the dehydrator. The screen filter may be clogged. If the dehydrator is of the refillable type, install a new cartridge or replace the strainer-

dehydrator. Make certain that the dehydrator is installed in position for proper direction of flow (See arrow on strainer-dehydrator).

(e) Inspect the expansion valve. The small filter in the inlet connection may be clogged. Wash it clean with carbon tetrachloride. Occasionally, however, dirt may obstruct the flow of liquid through the valve. Remove the valve and wash it with carbon tetrachloride. DO NOT CHANGE VALVE SETTING.

3. Leaking Power Element on Expansion Valve

The power element on the expansion valve consists of the thermal bulb, with connecting tubing on the bellows or diaphram which actuates the valve. If the power element is leaking, the valve will maintain an almost closed position, or may close completely. If the valve is slightly open, all symptoms will be the same as in Paragraph 2.

If the valve is entirely closed, the suction pressure will be low, and the evaporator coil and the suction line will be warm to the touch.

4. Expansion Valve Stuck in "Open" Position:

If the expansion valve is stuck in an "open" position, there will be an excessive amount of liquid being admitted to the low side of the system.

To Correct This Condition

(a) A small piece of dirt or scale may be holding the valve open. Remove the valve and wash it out.

(b) The thermal bulb may be loose on the suction line. Tighten it if necessary and insulate.

5. Insufficient Air over Condenser Coil:

A shortage of air over the condenser coil will cause the pressure to rise in the condenser and cause the thermal overload to trip, shutting the machine down.

To Correct This Condition

(a) Clean the condenser coil with a high velocity stream from an air hose. Also make sure that all service panels are tight.

6. Shortage of Condenser Water

When there is a shortage of condenser water due to the main water valve being partially closed, an automatic valve being stuck in an almost closed position or improperly adjusted, or a lack of pressure in the water mains, the head pressure in the condenser will rise and the condenser will feel hot. The liquid line will also feel warm. The condenser pressure may even rise to the point where either the high-pressure switch or the thermal overload elements in the motor starter will stop the compressor.

If the high-pressure switch stops the motor, the compressor will short-cycle. During the intervals when the compressor is off, the small amount of water available will reduce the head pressure to the point where the pressure switch can start the motor again. However, if the motor is overloaded sufficiently for the thermal overload elements in the motor starter to stop the compressor, there will be no short cycling but the compressor will start again after the thermal overload elements are reset.

To Correct This Condition

(a) Check water flow to condenser.

(b) Check water inlet control valve for proper action.

(c) Check for restriction in inlet, water strainer, or outlet of shell and tube condenser.

Water Shortage

It is recommended that the water supply line to the shell and tube condensers, be provided with a scale trap or water strainer to prevent scale and other foreign materials from entering the cooling tubes of the condenser, when unfiltered mill water is used for cooling. This will prevent stoppage of the condenser tubes.

7. Scale Trap at Suction of Compressor Clogged:

When the scale trap at the suction of the compressor becomes clogged with foreign matter, the suction pressure gauge will show high suction pressure, while the suction pressure beyond the scale trap will be low. To determine if this condition exists:

(a) Force-run the compressor until the suction gauge shows 0 lbs.
(b) Remove the bolts from the suction chamber and lift out the strainer.
(c) Wash the strainer in carbon tetrachloride.
(d) Install strainer and valve.

Note: If gaskets are damaged, they should be replaced.

8. Low Head Pressure, High Suction Pressure

This condition indicates loss of volumetric efficiency of the compressor. To check this condition, close valve "D" (low side service valve). Operate the unit with the auxiliary switch, using extreme care as oil may be lifted, causing the head valves to rupture.

To prevent damage to the head valves, operate the unit and listen very carefully for knocking in the compressor. If knocking is detected, shut off the unit immediately, leaving it off from one to two minutes. Continue this procedure until the suction guage reads 28" of vacuum. If the compressor is not capable of pumping at least 20" of vacuum, follow the instructions for removing the compressor valve plate. Replace with new or repaired compressor valve plate.

9. Air in System

When air is present in the system, it will cause excessive head pressures. In extreme cases the pressure may rise to a point where the pressure switch may stop the machine.

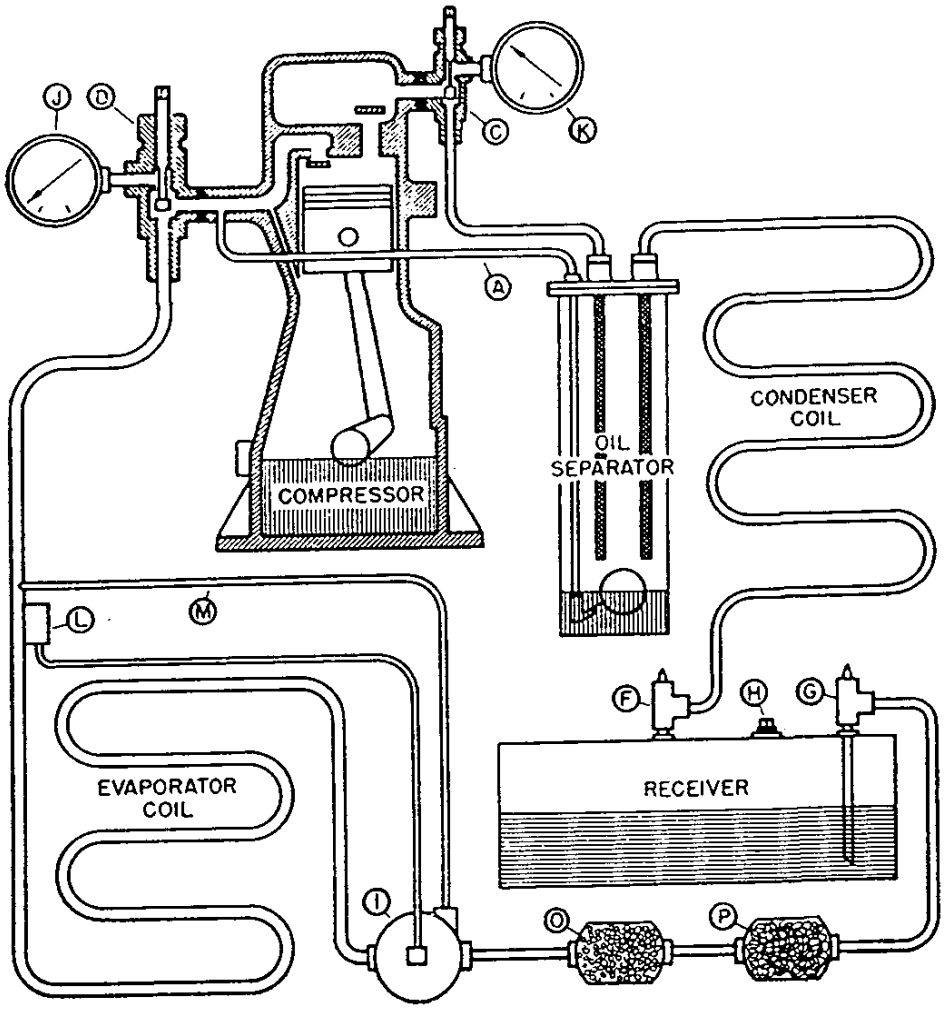
To determine if there is air in the system, the machine must be allowed to stand idle long enough for the entire system to cool down to the temperature of the surrounding air. After the entire system has attained the temperature of the surrounding air, the reading of the head pressure gauge should not be more than 10 lbs. above the saturation pressure corresponding to the surrounding air temperature.

To Remove Air from System

1. Turn selector switch to "off" position, stopping the machine.

2. Open high side on charging manifold, or purge valve on top of inlet header of condenser coil, allowing vapor to escape. If there is any air present, the vapor will feel hot, and will gradually cool as the air is replaced by refrigerant gas. A small amount of oil is present in the escaping vapor at all times. Check level on oil level sight glass of compressor.
3. When vapor begins to feel noticeably cooler, close high side manifold port.

REFRIGERATION CIRCUIT FOR LINTERN AIRE RECTIFIER



Symbol Identification

A. Oil Return Line
C. High Side Service Valve
D. Low Side Service Valve
F. Receiver Shut Off Valve
G. Liquid Line Shut Off Valve
H. Fusible Plug — 283°
I. Thermostatic Expansion Valve
J. Compound Gauge — Low Side
K. Pressure Gauge — High Side
L. Expansion Valve Bulb
M. Equalizer Line
*O. Dehydrator
*P. Strainer

*O & P may be one unit.

INSTRUCTIONS FOR PERFORMING SERVICE OPERATIONS

To Replace the Shaft Seal and Housing Cover

1. Shut off the machine.
2. Close suction service valve "D".
3. Operate the unit until the suction gauge "J" holds 0 lbs. pressure, then stop the unit.
4. Close high service valve "C".
5. Close receiver, shut off valve "F".
6. Open high side gauge port on manifold, allow pressure to escape.
7. Loosen flywheel nut, and remove flywheel (with wheel puller).
8. Loosen seal nut, using punch or chisel. The seal nut has a left hand thread.
9. Remove the seal nut and seal. Clean the shaft thoroughly.
10. Remove the cap screws, holding the housing cover plate in place.
11. Remove the housing cover by tapping around the outer edge, and prying lightly with screw driver between housing cover and compressor body.
    It is necessary to have an open top container to catch the oil from the compressor crankcase that will be lost when housing cover is removed.
12. Clean gasket surface on compressor.
13. Replace the housing cover and cover gasket and tighten cap screws.
14. Replace seal and tighten seal nut.
15. Replace flywheel and tighten flywheel nut.
16. Add oil to the compressor crankcase until proper level is reached.
17. Close manifold gauge port.
18. Open all valves and check for leaks.
19. Start the machine.

To Replace Head Valve Plate

1. Close valve "D".
2. Operate the unit with auxiliary switch until suction gauge "J" holds O lbs. pressure. Then stop unit.
3. Close valve "C".
4. Open high side manifold gauge port allowing pressure to reduce.
5. Remove head bolts and replace flapper valve plate.
6. Close high side gauge port.
7. Open valve "C".
8. Open valve "D".
9. Check for leaks.
10. Start the machine.

To Remove Compressor Body

The following procedure is for replacing the head valve plate up to, and including Item 4.

5. Remove the flywheel.
6. Disconnect valves "D" and "C" at flanges, leaving valves connected to lines—DO NOT DISCONNECT VALVES FROM LINES, AS REFRIGERANT WILL ESCAPE.
7. Disconnect the oil return line from the oil separator.
8. Replace the body, fasten valves to the body—NOTE: Use new gaskets, connect oil return line; open valve "D" and "C"; check leaks.
9. Start machine.

To Add Oil to Compressor

1. Close valve "D".
2. Operate the compressor until gauge "J" holds zero pressure.
3. Stop the unit.
4. Close valve "C".
5. Remove the oil plug from the side of the compressor body. (Disconnect oil return line if necessary).
6. Add recommended oil until it reaches the correct level. The correct level is approximately 2" above

the inside bottom of the crankcase. If too much oil is added serious damage will result.

7. Replace the oil plug.
8. Open valve "C".
9. Open valve "D".
10. Start the machine.
11. Check for leaks around the oil plug.

To Replace Thermostatic Expansion Valve

1. Close valve "G".
2. Operate the unit until gauge "J" holds zero pressure—Wait two minutes to see if pressure builds up on gauge "J". If no pressure, proceed as follows:
3. Close valve "D".
4. Remove expansion valve bulb "L" from the suction line.
5. Remove flange bolts from expansion valve "I". Disconnect equalizer line "M" from the valve.
6. Install a new valve.
7. Connect the equalizer line to the valve.
8. Place the valve in position. Make sure distributors fit squarely on the gasket provided in the valve.
9. Turn the flange bolts up tight.
10. Fasten bulb "L" to suction line.
11. Open valve "D".
12. Open valve "G".
13. Check for leaks. Repair all leaks.

To Remove Evaporator Coil

Follow instructions for replacing expansion valve.

To Remove One Evaporator Coil of a Multi-Evaporator Coil or Cab Unit

1. Pump machine down as described previously, closing valve C and D, and shutting off unit.
2. Remove bulkhead caps and refrigerant hose, and use caps to plug open end of system.
3. Disconnect electrical motor and heater connections.
4. Remaining systems may then be restarted and run while repairs on isolated evaporator coil or unit are made.

To Remove Condenser Coil

1. Shut off the unit.
2. Close valve "C".
3. Warm lower sections of the condenser coil with flame. Do not overheat.
4. Close valve "F".
5. Loosen the flare nut on valve "F" to purge the refrigerant left in coil.
6. Remove the bolts holding the coil; lift coil from the unit.

To Reinstall Coil

1. Bolt in place.
2. Open valve "C".
3. Purge the air from the coil at flare nut on valve "F".
4. Crack valve "F" until gauge "K" reads 20 lbs. pressure.
5. Check for leaks using Halide leak detector.
6. Open valve "F" all the way.
7. Add the refrigerant (see charging instructions).
8. Start the machine.

To Remove Receiver

1. Close valve "G".
2. Operate the machine until the gauge "J" holds approximately 20" of vacuum.

3. Close valve "F".
4. Disconnect the lines at valves "G" and "F".
5. Remove the receiver.
6. Some refrigerant will be lost unless you have a unit to evacuate refrigerant from system.

To Replace Dehydrator or Strainer

1. Close valve "G".
2. Operate the unit until gauge "J" holds zero pressure.
3. Close valve "D".
4. Remove the strainer and dehydrator as one unit.
5. Reinstall the strainer and dehydrator—bring flare nuts up tight.
6. Open valve "D".
7. Crack valve "G" and allow pressure to build up to 10 lbs. on gauge "J".
8. Purge the air from the line and coil at suction line connection of line "M".
9. Check for leaks, using Halide leak detector.
10. Open valve "G".
11. Start the unit.

To Repair Leak in Liquid Line, Evaporator Coil, Suction Line

1. Close valve "G".
2. Operate the unit until gauge "J" holds zero pressure for two minutes.
3. Close valve "D".
4. Loosen the flare nut at valve "G" to vent lines and coil.
5. Repair leaks. **Use Sil Fos solder.**
6. Disconnect bulb "L" when soldering in this section. Do not allow heat to contact bulb "L" as this will rupture expansion valve bellows.
7. Tighten the flare nut at valve "G".

8. If bulb "L" has been removed, replace it. Make certain the line has cooled.
9. Open valve "D" to mid-position.
10. Open valve "D".
11. Purge air on low side on charging manifold.
12. Open valve "G".
13. Check for leaks using Halide torch.
14. Start the unit.

Shutting Down the Refrigeration for Winter

On installations where there will be no call for cooling during winter months, the following steps should be taken.

The machine should be pumped down, i.e., all refrigerant should be stored in the liquid receiver. To accomplish this, close the receiver outlet valve and run the unit until suction gauge holds zero pounds. Close the suction valve. Stop the unit, then close all valves. Also on water cooled condenser, drain water from condenser if unit is to be subjected to freezing temperatures.

We unconditionally guarantee the rated performance of each Aire-Rectifier, when:

1. The model Aire-Rectifier recommended by us for the individual application is chosen.
2. Our recommendations as to size, enclosure, and insulation of the crane cab or pulpit are exactly followed.
3. Our serviceman is employed to connect refrigerant lines and/or put the machine into operation, except when we specifically authorize by letter any other arrangement.

GLOSSARY OF TERMS

ACTIVATED CARBON: A form of carbon made porous by special treatment by which it is capable of absorbing various odors, anesthetics and other vapors.

CHARGE: Amount of refrigerant in a system; to put in the refrigeration charge.

COMPRESSOR, REFRIGERANT: That part of a mechanical refrigerating system which receives the refrigerant vapor at low pressure and compresses it into a lower volume at higher pressure.

COMPRESSOR UNLOADING: A system of valves and components designed to mechanically vary the output of the compressor.

CONDENSATE: The liquid formed by condensation of a vapor. In air conditioning, water extracted from air, as by condensation on the cooling coil of a refrigeration machine.

CONDENSER, AIR COOLED REFRIGERANT: A condenser cooled by natural or forced circulation of atmosphere air through it.

CONDENSING UNIT: A specific refrigerating machine combination for a given refrigerant, consisting of a compressor, condenser coil, liquid receiver, and the regularly furnished accessories. A complete high side of a refrigeration system including the motor in a unit assembly.

COOLING SECTION: Usually referred to as the evaporator, consisting of evaporator coil, motor blower assembly, expansion valve and complete enclosure.

CYCLE: A complete course of operation of refrigerant back to a starting point, measured in thermodynamic terms (functions). Also used in general for any repeated process on any system.

CYCLE, REFRIGERATION: Complete course of operation of refrigerant back to a starting point, evidenced by: a repeated series of thermodynamic processes, or flow through a series of apparatus, or a repeated series of mechanical operations.

VALVE, HEAD PRESSURE CONTROL: A valve intended to keep head pressure from falling below a predetermined setting.

VALVE, HOLD BACK: An automatic valve located between the evaporator outlet and compressor inlet that is responsive to its own outlet pressure and functions to throttle the vapor flow so as to prevent the suction pressure at the compressor inlet from exceeding a selected value. It is used primarily to prevent overload on compressor motors.

VALVE, PURGE: A device to allow non-condensible gases to flow out of the system.

VALVE, SERVICE: A valve intended to help isolate an apparatus from the rest of the system.

VALVE, SOLENOID: A valve which is closed by gravity, pressure, or spring action and opened by the movement of a plunger due to the magnetic action of an electrically energized coil, or vice-versa.

VALVE, SUCTION: In a compressor, the valve which allows refrigerant to enter the cylinder from the suction line and prevents return flow.

VALVE, WATER REGULATOR: An automatic valve to control the flow of cooling water through a condenser.

WILLIAM R. ARNOLD, INC.
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Jamestown, New York 14701
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San Mateo, California 94402
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Medina, Ohio 44256
(216) 522-1432

FALLON INDUSTRIAL SALES
15550 W. Hardy Road
Houston, Texas 77060
(713) 999-3394

MONLUX COMPANY
P. O. Box 500
Mercer Island, Washington 98040
(206) 232-3100

OVERSEAS REPRESENTATIVES

AUSTRALIA

LINTERN (AUST.) PTY LIMITED
P. O. Box 568
Miranda, N.S.W. 2228 Australia

SOUTH AFRICA

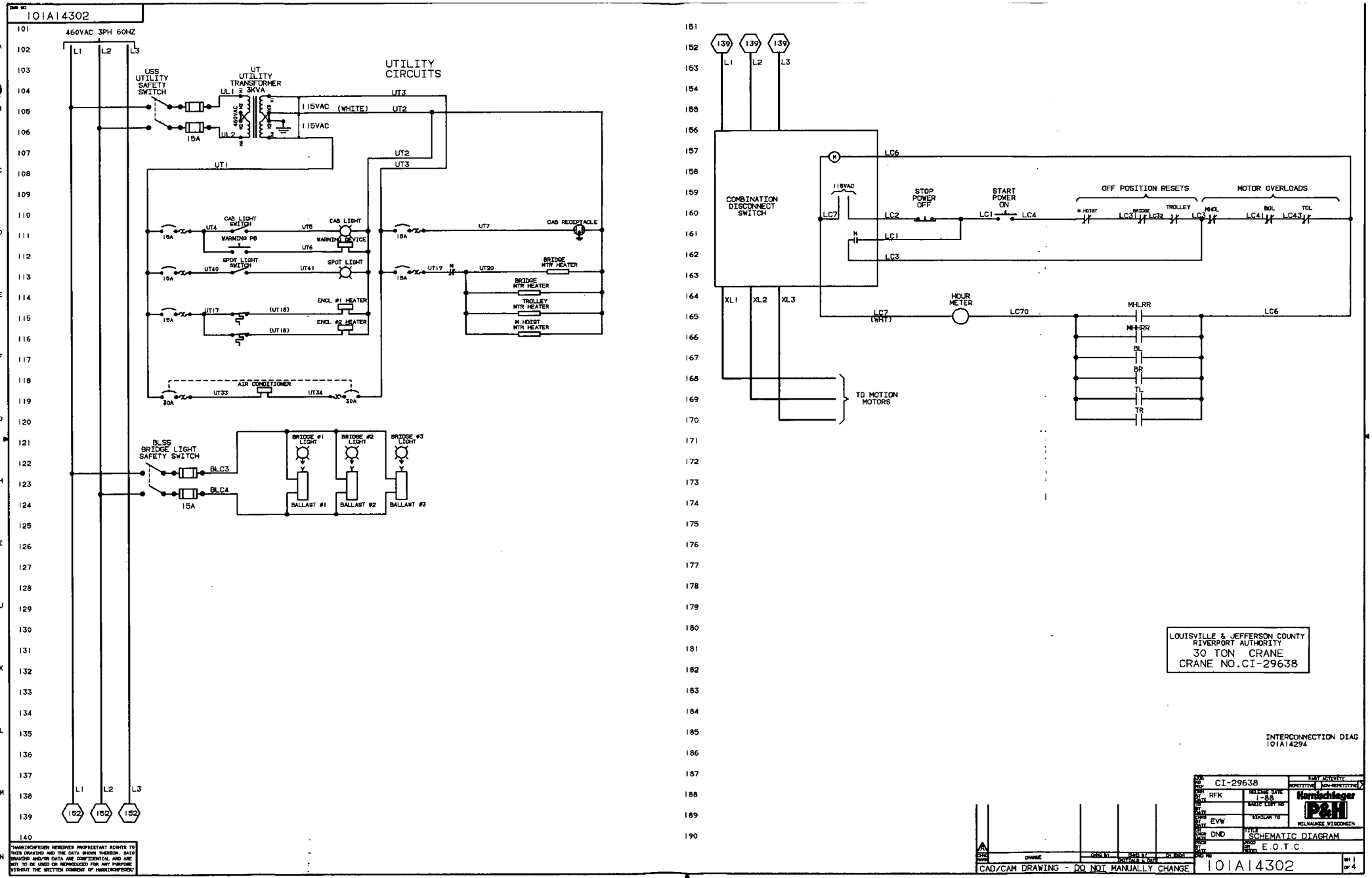
SAFURNCO (PTY) LIMITED
P. O. Box 8071
Johannesburg, South Africa 2000
(011) 836-2631

CANADA

CANREP (FORMERLY RAILWAY &
POWER ENGINEERING CORP. LTD.)
St. James Street, West, Montreal, Quebec
and all principal cities.

SOUTH AMERICA

ING. CARLOS A. EVANS
Edificio Artico - Piso 3 Oficina 33B
Av Jose Maria Vargas - Santa Fe Norte
Caracas, Venezuela
(02) 979-9714



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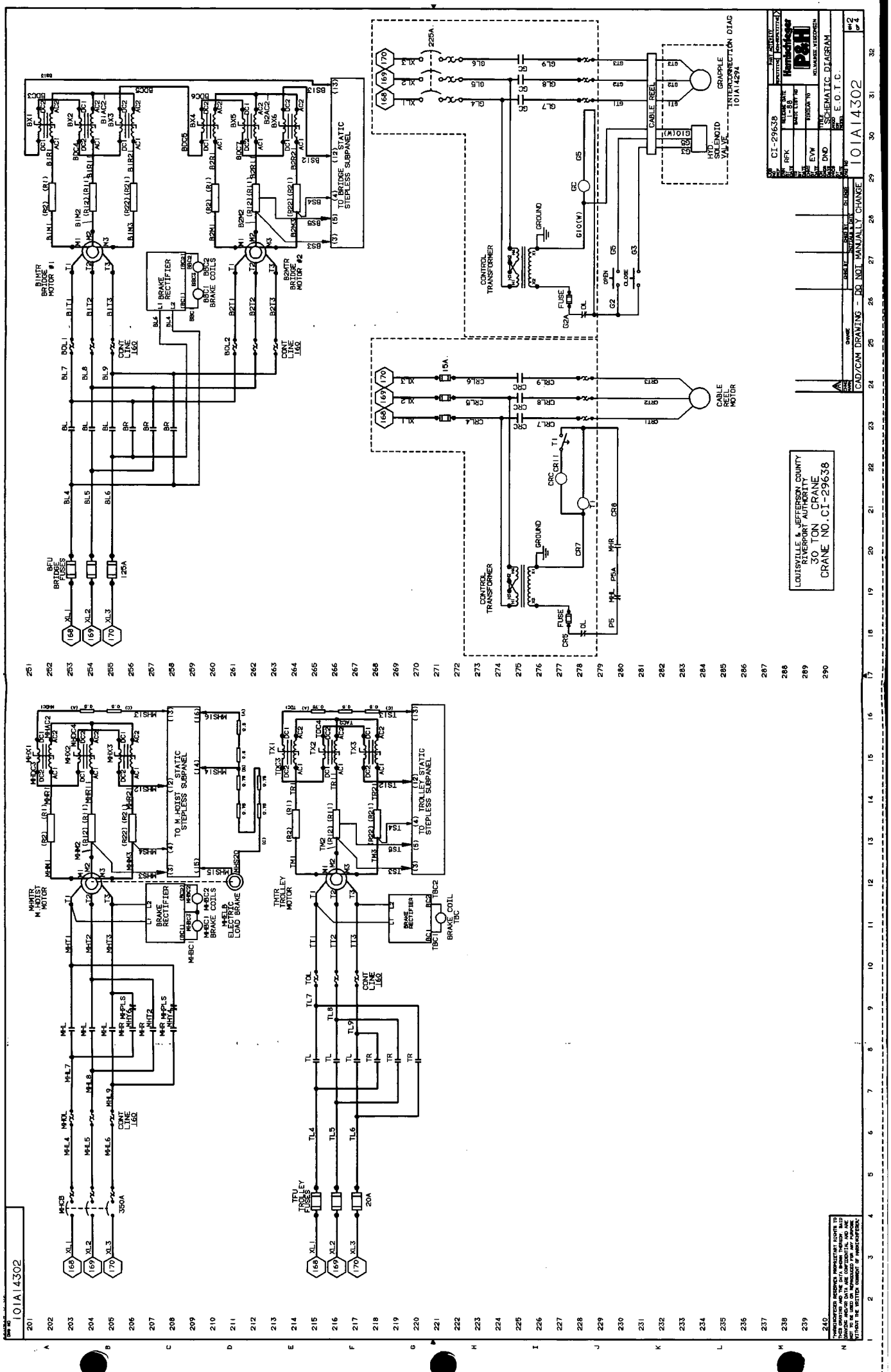

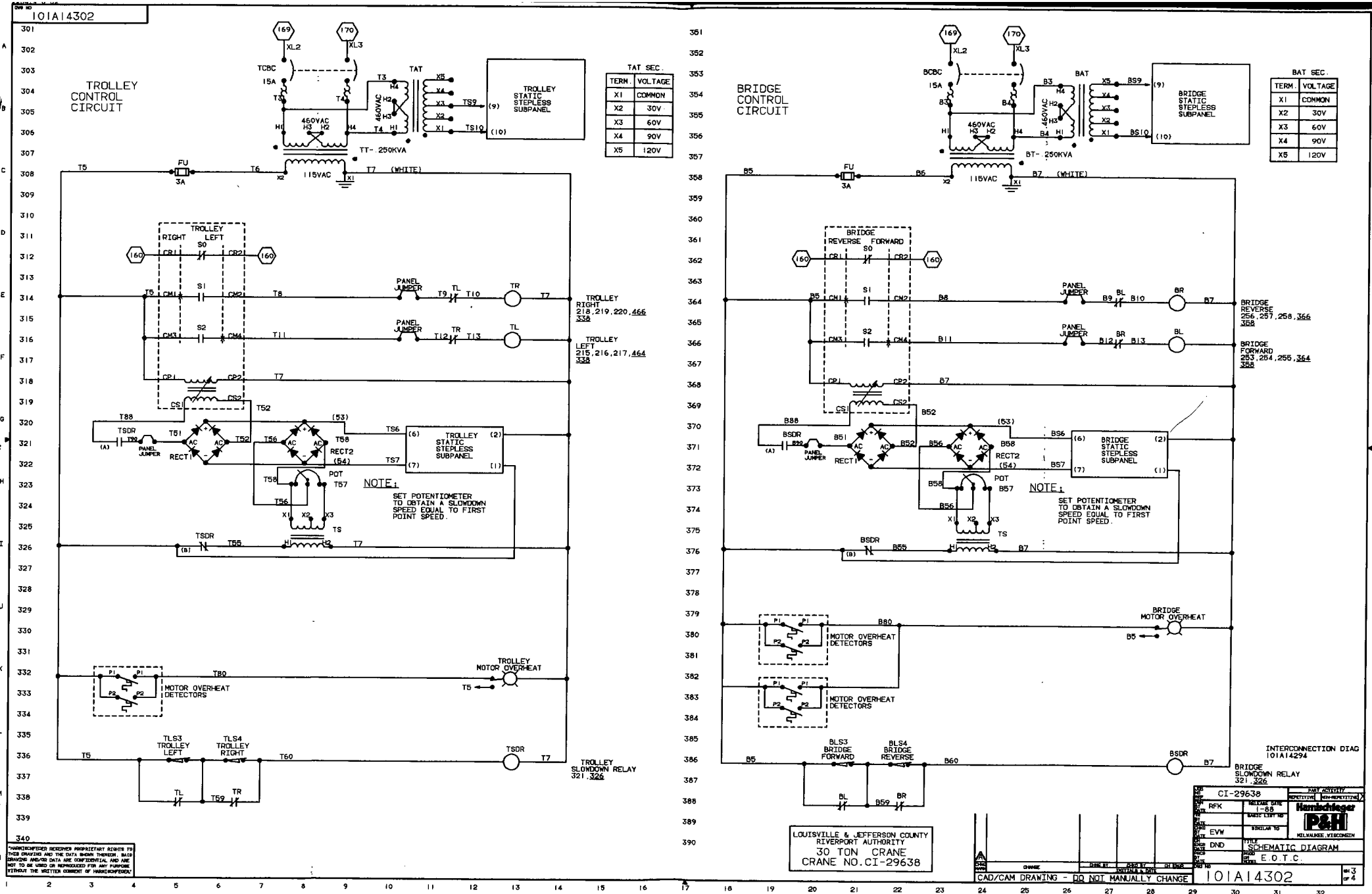

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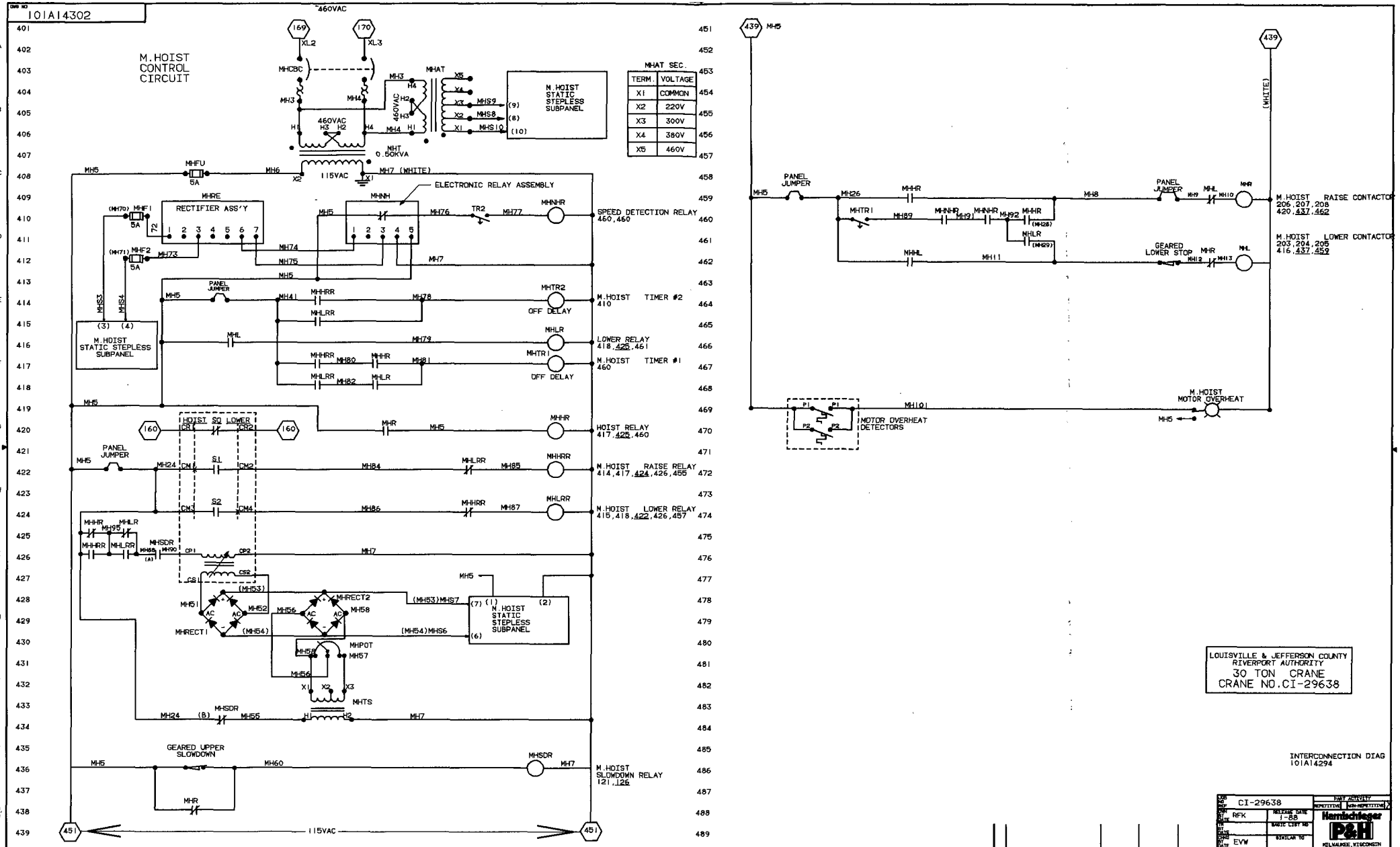
M.HOIST CONTROL CIRCUIT



LOUISVILLE & JEFFERSON COUNTY
RIVERPORT AUTHORITY
30 TON CRANE
CRANE NO.CI-29638

INTERCONNECTION DIAG
101A14294

CI-29638	PART ACTIVITY: REPETITIVE / NON-REPETITIVE
RFK	RELEASE DATE 1-88
	BASIC LIST NO
EVW	SIMILAR TO
DND	Harnischfeger P&H MILWAUKEE, WISCONSIN
	TITLE SCHEMATIC DIAGRAM
	PROD OR MDL E.O.T.C.
	DWG NO 101A14302
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SHEET 1 OF 1 SHEETS

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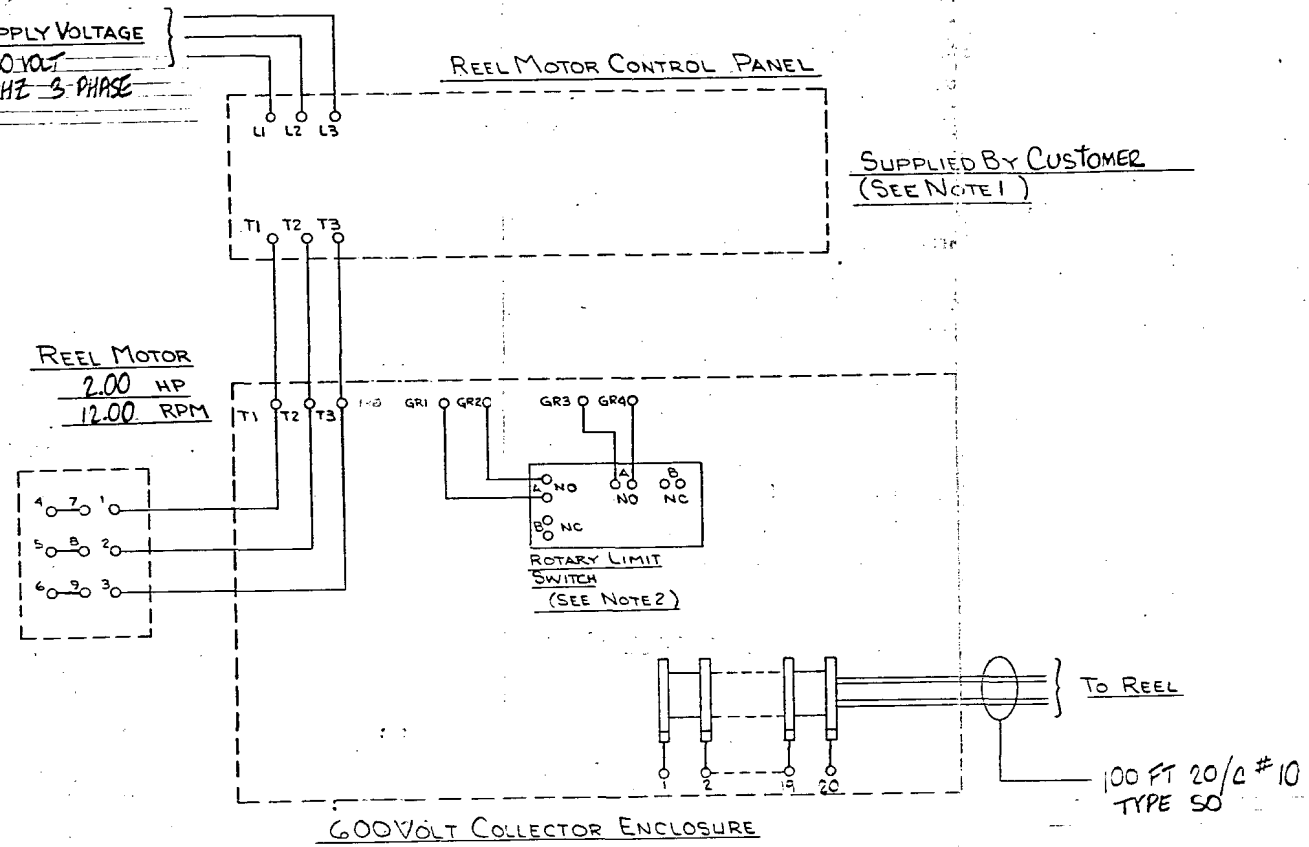
NOTES

NOTE 1 - FOR DETAIL REFER TO REEL MOTOR CONTROL CIRCUIT WIRING DIAGRAM.

NOTE 2 - GEARED ROTARY LIMIT SWITCH.



POLE	AMPACITY	USAGE
20	35 A	CONTROL

REVISIONS				HOLE LIST		
LET	DESCRIPTION	DATE BY	SYM	SIZE	QTY.	
A	RELEASE ECN					

BRUNING 40-107 42459

UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE INCHES
TOLERANCES
ONE PLACE DEC. ± .030
TWO PLACE DEC. ± .030
THREE PLACE DEC. ± .010
ANGLES ± 1°

Gleason Reel

GLEASON REEL CORP.
MAYVILLE, WISCONSIN
CABLE & HOSE REELS – POWERTRAK

APPLICATION

NEXT ASSY	SIM. TO

WIRING DIAGRAM

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SHEET 1 OF 1

Replacement Parts
and
Service Manual

HARNISCHFEGER CORPORATION

Modernization Order 93-130788

Document Number 93-130788-PSM-4-JSN

For Serial Numbers CI-29638

Harnischfeger

P&H

milwaukee, wisconsin. 53201

January 19, 1994

GENERAL REPLACEMENT PARTS INFORMATION

How To Order Replacement Parts

This manual contains the information needed to order replacement parts for this P&H product. To insure prompt service, each replacement parts order must contain the following information:

1. Product serial number
2. Capacity of the product
3. Part number(s)
4. Quantity of each part required
5. Description of the part
6. Voltage, Phase and Cycles
7. Correct shipping address

Replacement parts can be ordered from Harnischfeger Material Handling Centers located in major cities throughout the United States and Canada. Consult your local telephone yellow pages for the name and location of your nearest Harnischfeger Material Handling Center.

Product Serial Numbers

Crane serial numbers are located on the trolley and bridge.

Hoist serial numbers are stamped on the nameplate and on the bottom of the motor bracket.

Return of Parts

Harnischfeger Corporation will not accept the return of any part unless accompanied by a Harnischfeger Claim Tag. These claim tags are issued at the time the authorization to return a part is issued. Claim tags must be attached to the outside of the package containing the returned part.

Claims

All shipments are carefully inspected and delivered to the carrier in good order. Upon receipt of the shipment, it should be inspected for loss or damage.

If loss or damage has occurred, the shipment should be refused until the carrier make proper notation concerning the loss or damage. In the event of concealed loss or damage, notify the carrier immediately.

By following these suggestions, you will encounter less difficulty in settling your claim with the carrier

SOLD TO	466570 Superior Crane Corp P.O. Box 340197 Milwaukee, WI 53234
SHIP TO	Customer Pick–Up

SPECIAL INSTUCTIONS AND INFORMATION

Please call Chuck Roanhouse at Superior Crane when order is ready for pick up.

CUSTOMER ORDER NO.	PLEASE REFER TO OUR ORDER NO.
930655	93–130788

DATE ENTERED	SHIPMENT	VIA	SERIAL NO.
9–2–93	12–3–93	Customer will Pick–Up	CI–29638

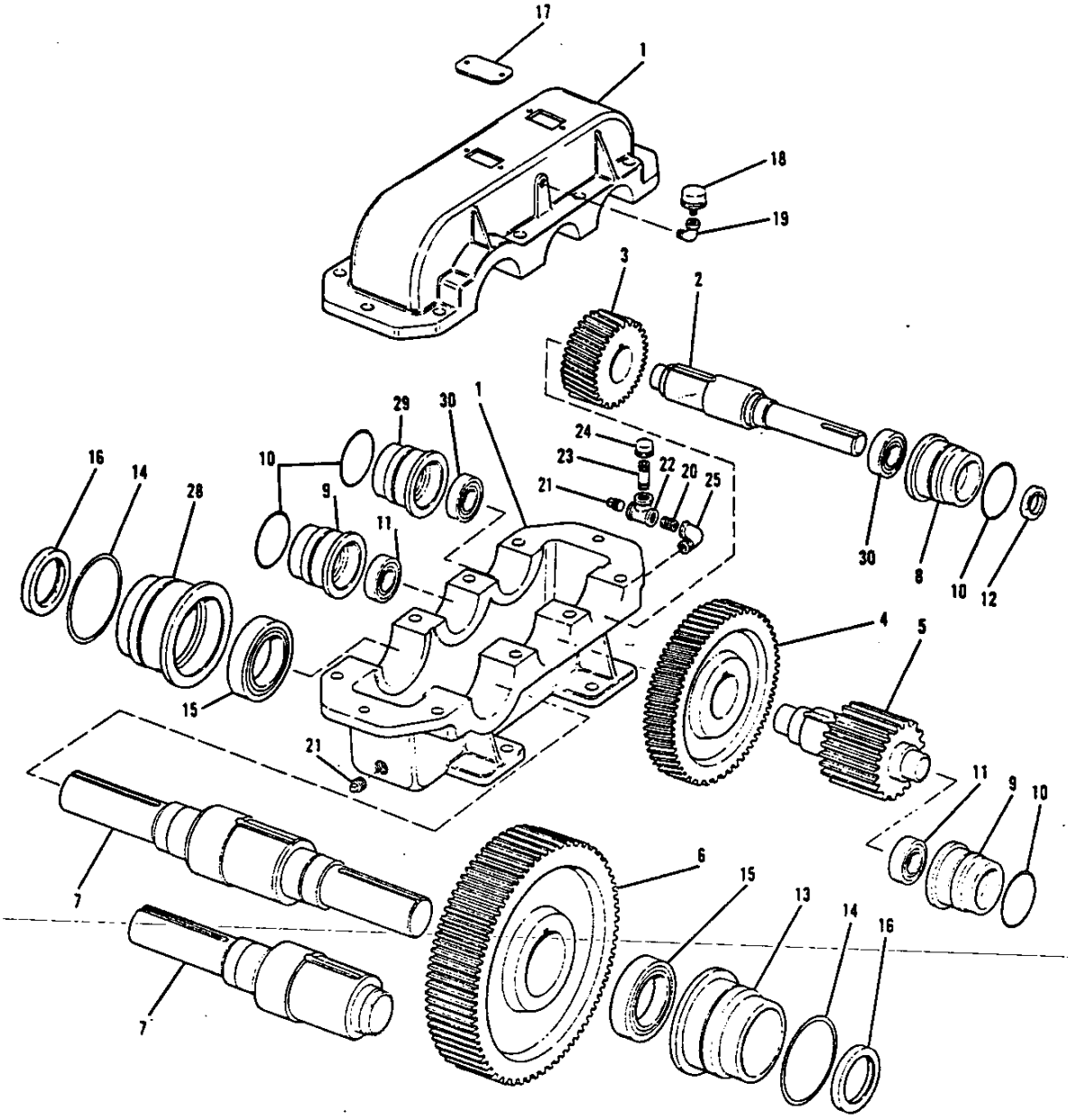
PROPOSAL DATE	PROPOSAL NO.	F.O.B.	FREIGHT	SHIPPING WT.	DELIVERY TIME
6–30–93	Q–29270	Milwaukee, WI	N/A		

TERMS	
NET 45 DAYS	JAH/RDK

REPRESENTATIVE–DISTRICT	NO.	REPRESENTATIVE–DISTRICT	NO.	REPRESENTATIVE–DISTRICT	NO.	CUSTOMER NO.
Sedushak–Milwaukee	100					

DESCRIPTION	QUANTITY	UNIT PRICE	EXTENSION
Harnischfeger Corp. will furnish:			
1. Replacement D303 bridge drive speed reducers to replace existing D153 speed reducers.		TOTAL LOT NET	[redacted]
P/N 100A7013F216	1		
P/N 100A7013F316	1		
(reducers are opposite hand)			
Installation and modification of existing supports are by customer.			
The customer or installing contractor is responsible for: a. Locating and mounting of all material. b. Supplying all hardware, brackets,supports, guards, (such as required for resistors), conduit, connectors, wires, and lugs, etc. c. Mounting and wiring all equipment in accordance with all Local, State, and Federal regulations.			
Contact our Service Department if supervision or checkout is required.			
NOTES: 1. Order acknowledgement is subject to the terms and conditions on the face and reverse side hereof. 2. Paint Horizon Yellow (#440Y). 3. Furnish (5) Bills of Material, (5) dimensional drawings. 3 – to customer, Attn: Chuck Hoanhouse 1 – to Don Sedushak–Milwaukee Sales Office 1 – to Sales File 4. Furnish (4) parts manuals.			

ILLUSTRATION NO. CI-7A
TYPE D-303 SPEED REDUCER ASSEMBLY



Harnischfeger
P&H

ILLUSTRATION NO. CI–7A–16
TYPE D–303 SPEED REDUCER ASSEMBLY

100A7013–216 AS SHOWN:
100A7013–316 OPPOSITE THAT SHOWN:

Item No.	Description	Part Number	Qty.
1	GEAR CASE	14A1663F1	1
2	PINION/SHAFT, MOTOR (INCLUDES KEY)	1F12729C2F1	1R
	KEY, 14MM X 9MM X 55MM	20H3869D55	1
3	PINION, MOTOR	INTEGRAL	–
4	GEAR, MOTOR	1F12731C2	1R
5	PINION/SHAFT, INTERMEDIATE (INCLUDES KEY)	1F12733C1F1	1
	KEY, 20MM X 12MM X 50MM	20H3877D50	1
6	GEAR, DRIVE	1F12738C3	1
7	SHAFT, DRIVE (INCLUDES KEYS)	10F9404F1	1
	KEY, 25MM X 14MM X 93MM	20H3879D93	1
	KEY, 28MM X 16MM X 85MM	20H3880D85	1
8	RETAINER, BEARING	25F3260D2	1
9	RETAINER, BEARING	25F3528D1	2
10	O–RING	45Z91D67	8
11	BEARING	25Z494D5	2R
12	SEAL, OIL	18Q154D102	1R
13	RETAINER, BEARING	25F3254D1	1
14	O–RING	45Z91D91	4
15	BEARING	25Z494D12	2R
16	SEAL, OIL	18Q154D141	R
17	COVER, INSPECTION	914H28–2	1
18	BREATHER	46Z4	1
19	STREET ELBOW, 3/8 IN X 90 DEG	2416V018	1
20	PIPE NIPPLE, 3/4 IN X 38 MM	2419V134	1
21	PIPE PLUG, 3/4 IN	2423V005	2
22	PIPE TEE, 3/4 IN	2425V005	1
23	PIPE NIPPLE, 3/4 IN X 50 MM	2419V136	1
24	PIPE CAP, 3/4 IN	2403V005	1
25	STREET ELBOW, 3/4 IN X 90 DEG	2416V020	1
26	LUBRICATION CHART	32Z340	1
27	LABEL, OIL LEVEL	32Z145	1
28	RETAINER, BEARING	25F3254D2	1
29	RETAINER, BEARING	25F3260D1	1
30	BEARING	25Z494D4	2R