



OPERATION, MAINTENANCE AND MONITORING MANUAL VOLUME 2 – MANUFACTURERS INFORMATION

**NIAGARA COUNTY REFUSE SITE
WHEATFIELD, NEW YORK**

OCTOBER 2000, REV 1 DECEMBER 2000

REF. NO. 05723 (17)

This report is printed on recycled paper.

**Prepared by:
Conestoga-Rovers
& Associates**

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Waterloo, Ontario
Canada N2V 1C2**

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SECTION G1
LIST OF CONTRACTORS

**NIAGARA COUNTY REFUSE SITE
WHEATFIELD, NEW YORK
CONTRACTORS LIST**

♦ **GENERAL**

HASELEY CONSTRUCTION CO., INC.
10315 LOCKPORT ROAD
NIAGARA FALLS, NEW YORK 14304
716-297-1550

RANDALL RETZLAFF
PAGER : 448-6191
WILLIAM BEY
PAGER : 448-6538

♦ **HEALTH AND SAFETY**

WATTS ENGINEERS
3826 MAIN STREET
BUFFALO, NEW YORK 14226
716-836-1540

ANDREW KLIMEK

♦ **VFPE LINER**

CHENANGO CONTRACTING, INC.
29 ARBUTUS ROAD
JOHNSON CITY, NEW YORK 13790
607-729-8500

CHUCK RHOADES

♦ **ELECTRICAL**

CIR ELECTRICAL CONSTRUCTION CORP. GREG JAKABOWSKI
2750 KENMORE AVENUE
TONAWANDA, NEW YORK 14150
716-874-5614

♦ **MECHANICAL**

JOHN W. DANFORTH COMPANY
1940 FILMORE AVENUE
BUFFALO, NEW YORK 14214
716-832-1940

CARL BYKOWSKI

♦ **PRE-ENGINEERED BUILDING**

RAND & JONES ENTERPRISES CO., INC.
36 HOPKINS ROAD
WILLIAMSVILLE, NEW YORK 14221
716-626-1080

ED MULLICKI

♦ **SURVEY**

**MODI ENGINEERING
7730 FRONTAGE ROAD
CICERO, NEW YORK 13039
315-458-8980**

DON TROTTA

♦ **MONITORING WELLS / GAS VENTS**

**SJB SERVICES, INC.
1951-1 HAMBURG TURNPIKE
BUFFALO, NEW YORK 14218
716-821-5911**

JOE GENOVESE

♦ **LANDSCAPE**

**WAYNE HYDROSEEDING & LANDSCAPE
2733 HANCE ROAD
MACEDON, NEW YORK 14502
315-986-4586**

JOHN MURPHY

♦ **GEOTECHNICAL**

**GZA GEOENVIRONMENTAL, INC.
364 NAGEL DRIVE
BUFFALO, NEW YORK 14225
716-685-2300**

JOHN DANZER

♦ **FENCING**

**WIRE PRODUCTS CO., INC.
565 FILLMORE AVENUE
TONAWANDA, NEW YORK 14150
716-695-3222**

JEAN HOLLAND

SECTION G2
WARRANTIES



Buildings Division Warranty

BUTLER MANUFACTURING COMPANY ("Butler") warrants the material furnished by Butler for the building described below (the "building") to be free from defect in material or workmanship on the shipment date. Butler will correct by repairing, repainting or by furnishing replacement materials at its option any such defect reported to Butler within one (1) year from the shipment date. All materials except those further warranted below or those covered by a separate Warranty Endorsement are included in the one (1) year time period. As used in this warranty, the term "reported" refers to the procedure set forth in paragraph 5 on the reverse side.

Owner NIAGARA COUNTY REFUSE DISPOSAL DISTRICT

Building Location 50 WITMER RD. N. TONAWANDA NEW YORK 14120
(Street) (City) (State) (Zip Code)

Butler Order No. 20-044333-1 Shipment Date 5-14-99

Type of Roof Panels STANDARD Type of Wall Panels STANDARD

PAINTED WALL AND ROOF PANELS, TEXTURE-COTE™ WALL PANELS AND CERTAIN OTHER COMPONENTS ARE FURTHER WARRANTED AS FOLLOWS:

A. Painted Wall and/or Roof Panels:

1. The Butler-Cote® 500FP paint system (BMC EMS 10,156) on galvanized steel roof and/or wall panels in standard Butler-Cote roof and wall colors will not, under normal weather and atmospheric conditions, for a period of 20 years from the date of shipment:
 - a. Crack, check or peel (lose adhesion);
 - b. Chalk in excess of ASTM D4214 No. 8 rating;
 - c. Fade (change color) more than 5 color difference units per ASTM D2244;
 - d. Decline in gloss more than 50% per ASTM D523;
 - e. Perforate due to corrosion.

B. Texture-Cote Finish on Wall Panels:

1. The aggregated Texture-Cote finish in standard colors on prime painted galvanized steel panels will, not under normal weather and atmospheric conditions, for a period of ten (10) years from the date of shipment:
 - a. Crack, check or peel (lose adhesion).

C. Certain Other Components:

1. The warranty period for the following standard products shall expire five (5) years from the date of shipment:
 - a. Insulated glass;
 - b. Lite*Panl®;
 - c. Fire*Lite™ 320 (Plastic Domes);
 - d. Clear*Vue™ Skylight (Plastic Domes);
 - e. Sky-Hatch™ Roof Scuttle (Lid Assembly);
 - f. IFCurb (interior flange) Specifications 4792;
 - g. OTS Curb (outside the square) Specifications 4792.

SIGNATURE REQUIRED—SEE REVERSE SIDE

TERMS AND CONDITIONS

THE FOREGOING WARRANTIES ARE SUBJECT TO THE FOLLOWING LIMITATIONS. ADDITIONAL PROVISIONS AND CONDITIONS, INCLUDING THOSE WHICH ARE CONTAINED ON THE REVERSE SIDE:

1. The warranties expressed herein do not apply:
 - a. to panels installed in areas subject at any time subsequent to installation to exposure to corrosive or aggressive conditions such as airborne abrasives, salt water, marine atmospheres, spray of salt or fresh water, fallout or exposure to fumes, vapors or solid emanations containing acids, alkalis, or compounds of mercury, or other corrosive chemicals, ash or fumes (for example, without limiting the foregoing, this Warranty does not apply to a building which is subject to salt or fresh water spray from an ocean, lake or cooling tower or to corrosive agents emanating from a manufacturing or other processing plant housed within the building or nearby;
 - b. to failures arising out of mechanical or chemical damage which may occur during shipment or during storage on the job site.
 - c. to deterioration caused by condensates or corrosive fumes, generated or released inside the building, or failure to remove construction debris or other accumulations of foreign substances or materials from the surface of roof panels, or condensation on CMR-24 liner panels;
 - d. to roof panels in the event of failure to provide free drainage of water, snow or ice;
 - e. to failure caused by acts of God, falling objects, external forces, explosions, fire, riot, civil commotion, acts of war, radiation, defects in any part of the foundation of the building, or the attachment of components, such as vents, signs, fascia, skylights, pipes, sprinklers or any other such materials, accessories or machinery, the attachment of which is not made known to and approved by Butler in writing;
 - f. to products or materials which are not manufactured by Butler except to the extent of the guarantee given by the actual manufacturer;
 - g. to used materials or to materials repaired or replaced under this Warranty except to the extent of the remainder of the applicable warranty period (to repaired, repainted, replaced or used material);
 - h. to any paints or coatings applied after installation not furnished or specifically recommended in writing by Butler;
 - i. to failures arising out of damage which may occur during storage on the job site, erection, roof traffic or maintenance.
 - j. to panels erected outside the 48 contiguous United States, Alaska, Mexico and Canada;
 - k. to the alteration of the surface appearance of the Texture™ Cote on wall panels caused by the accumulation of dirt or other foreign substances. Due to the rough textured nature of any aggregated or stucco-type surface, it is normal to expect some such accumulation. Cleaning will usually restore the original appearance. Cleaning is the responsibility of the owner and is not covered by this Warranty.
2. As used in this Warranty, the terms "roof panel" and "wall panel," exclude vents, gutters, skylights, any interior liner panel, trim, flashing or other attachments to the roof or wall.
3. Butler does not warrant components or accessory items to be free of condensation caused by high humidity inside the building and/or temperature differentials between inside and outside (for example, without limiting the foregoing, there is no warranty against condensation forming on windows, doors, VistaWall®, Lite*Panel®, and ventilators).
4. Butler does not warrant any product component or material to meet local, municipal, or state ordinances, codes, laws or regulations.
5. The obligations of Butler under this Warranty shall not arise unless Butler is notified and this Warranty is presented, together with a written statement specifying the claim or failure within sixty (60) days after a failure is first called to the attention of the owner, and not later than the expiration of the applicable warranty period. Butler shall determine whether correction of the defect or failure shall be by repairing, repainting or by furnishing replacement materials. Butler's liability shall not arise unless the correction is made under the supervision of, or with written approval of Butler.
6. The obligations of Butler hereunder extend only to the original owner listed above and the Butler Builder to whom the materials are initially sold. This Warranty may not be made the subject of any assignment or transfer by such owner or Butler without the written consent of Butler.
7. Except where such disclaimers and exclusions are specifically prohibited by applicable law, THE FOREGOING SETS FORTH THE ONLY GUARANTIES OF WARRANTIES APPLICABLE TO SAID BUILDING AND THE COMPONENTS THEREOF AND SAID WARRANTIES ARE GIVEN EXPRESSLY AND IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE AND ALL WARRANTIES WHICH EXCEED OR DIFFER FROM SAID WARRANTIES ARE DISCLAIMED BY BUTLER. The owner agrees that oral statements about the Building and components thereof made by Butler's representatives, or statements contained in Butler's or others' general advertising, pamphlets, brochures, or other printed matter do not constitute warranties and that acquisition of the building and components thereof was not made in reliance upon them. Except where such disclaimers and exclusions are specifically prohibited by applicable law, THE OWNER'S AND THE BUTLER BUILDER'S SOLE AND EXCLUSIVE REMEDY AGAINST BUTLER SHALL BE LIMITED TO THE APPLICABLE WARRANTIES SET FORTH HEREIN AND THE ENDORSEMENTS, IF ANY, ISSUED TOGETHER WITH THIS DOCUMENT AND NO OTHER REMEDY (INCLUDING BUT NOT LIMITED TO THE RECOVERY OF DIRECT, INCIDENTAL, SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES FOR LOST PROFITS, LOST SALES, INJURY TO PERSON OR PROPERTY, OR ANY OTHER LOSS) SHALL BE AVAILABLE TO THE OWNER OR THE BUTLER BUILDER OR ANY OTHER PERSONS OR ENTITIES, WHETHER BY DIRECT ACTION, FOR CONTRIBUTION OR INDEMNITY OR OTHERWISE. This exclusive remedy shall not be deemed to have failed its essential purpose as long as Butler is willing and able to carry out the terms of the warranties set forth herein.
8. Title to any replaced material shall pass to Butler.
9. The construction and interpretation of this Warranty shall be governed by the laws of the state in which the building is erected.
10. Butler shall not have any obligation under any warranty or guarantee until all bills for material, installation and erection of said building and components thereof and labor and other work performed by Butler and/or the Butler Builder have been paid in full.
11. This Warranty shall become valid only when signed by the owner and returned to Butler within 1 year from the shipment date.

Read and accepted:

LBM CONSTRUCTION INC.
(Butler Builder®)

By JOHN E. MYERS 02/23/00
(Date)

NIAGARA REFUSE DISPOSAL DIST.
(Building Owner)

By [Signature]
(Date)

BUTLER MANUFACTURING COMPANY
P.O. BOX 419917
KANSAS CITY, MISSOURI 64141-0917

By [Signature]

Clive E. Willis
President, Buildings Division

CHENANGO CONTRACTING, INC.

29 ARBUTUS ROAD
JOHNSON CITY, NEW YORK 13790
(607) 729-8500 FAX (607) 729-2415

TRANSMITTAL

To: Haseley Companies
10315 Lockport Road
PO Box 212
Niagara Falls, NY 14304-0212

Date: August 11, 2000

Attention: Bill Bey
Reference: Niagara County Landfill

We are forwarding to your attention:

☒ Attached
☐ Under Separate Cover via the following items:

☐ Plans ☐ Samples
☐ Specifications ☒ Other:

Copies	Description

2	Niagara County Landfill Warranties.

**** Please have an authorized representative of Niagara County
execute one warranty and return to:**

Mara Nicola
Serrot International, Inc.
125 Cassia Way
Henderson, NV 89014

Please notify us if enclosures are not as noted!

Copies To:

By: Lori A. Poirier





August 10, 2000

Mr. Chuck Rhoades
Chenango Contracting
29 Arbustus Road
Johnson City, NY 13790

RE: Serrot International, Inc. Twenty-Year Pro-Rated Limited
Warranty for Geocomposite Material

Enclosed please find two copies of the original Geocomposite Material Warranty issued to the Niagara County Refuse Disposal District.

Please note that we require the signature of a duly authorized representative of the Niagara County Refuse Disposal District on page 3 of the warranty. When signed, please return one original to my attention at the above address.

If I can answer any questions relative to the above, please do not hesitate to contact me at extension 417. Thank you for your attention to my request.

Sincerely,

A handwritten signature in black ink, appearing to read "Mara Nicola", written in a cursive style.

Mara Nicola
Contracts Administration

Enclosure

cc: L. Tockey



**TWENTY-YEAR
PRO-RATED LIMITED WARRANTY
FOR SERROT INTERNATIONAL, INC.
GEOCOMPOSITE MATERIAL**

Project: Niagara County Landfill

Order Placed on 5/21/99

Subject to the terms and conditions set forth below, SERROT INTERNATIONAL, INC. warrants to NIAGARA COUNTY REFUSE DISPOSAL DISTRICT that the geocomposite material sold to CHENANGO CONTRACTING, pursuant to Serrot International, Inc. Job No. 8207, for installation by CHENANGO CONTRACTING at the above referenced Project site is free from manufacturing defects aging for a period of twenty years from the date of manufacture, and that the geocomposite material, when properly installed, covered and maintained, will not suffer significant deterioration due to typical atmospheric conditions and normal weather aging during the life of this Warranty. This Warranty (a) does not cover installation services by CHENANGO CONTRACTING or any other third party and (b) extends only to the geocomposite material.

This Warranty covers only those defects in material and workmanship in the geocomposite material which existed at the time of its manufacture. This Warranty does not cover any damage to the geocomposite material, or defects in the geocomposite material found to have been a result of misuse, abuse or conditions existing after manufacture including, but not limited to, rough handling; malicious mischief; vandalism; sabotage; fire; acts of God; acts of the public enemy; acts of war or public rebellion; severe weather conditions of all types; or damage due to any of the following: UV exposure; ice; wind; subsidence; chemicals harmful to the geocomposite material; machinery; improper installation; excessive stress from any source; improper handling during transportation, unloading, storage or installation; floating debris; foreign objects or animals.

This Warranty is subject to the following conditions:

1. The geocomposite material shall have been transported, unloaded, stored and installed in accordance with Serrot International, Inc.'s recommended procedures and in such a manner as to not cause damage to the geocomposite material;
2. The geocomposite material shall have been installed on compacted soil free of sharp protrusions and foreign objects to a depth of 6 inches; and
3. If "fill" is used over the top of the geocomposite material it shall be free of all foreign and sharp objects.

Failure to comply with these conditions in all respects will void this Warranty.

In the event circumstances are found to exist which NIAGARA COUNTY REFUSE DISPOSAL DISTRICT believes may give rise to a claim under this Warranty, the following procedure shall be followed:

- a) NIAGARA COUNTY REFUSE DISPOSAL DISTRICT shall give Serrot International, Inc. written notice of the facts and circumstances of said claim within 10 days of becoming aware of said facts and circumstances. Said notice shall be by registered or certified mail, return receipt requested, postage prepaid, addressed to Robert A. Otto, C/O Serrot International, Inc. 125 Cassia Way, Henderson, NV 89014. The words "WARRANTY CLAIM" shall be clearly marked on the face of the envelope in the lower right hand corner. Said notice shall contain, at a minimum, the name and address of the owner, the name and address of the installation, the name and address of the installer, the dates upon which the material was purchased and installation was completed and the facts known NIAGARA COUNTY REFUSE DISPOSAL DISTRICT upon which the claim is based. Failure to provide Serrot International, Inc. with timely notice of the claim shall void this Warranty.
- b) Within twenty days after receipt of the notice described in paragraph a, above, Serrot International, Inc. shall notify NIAGARA COUNTY REFUSE DISPOSAL DISTRICT either that it will send a representative to inspect the allegedly defective geocomposite material, or that it does not wish to do so. NIAGARA COUNTY REFUSE DISPOSAL DISTRICT shall pay the expenses incurred by Serrot International, Inc. in making the inspection, including current per diem rates for personnel involved in making the



inspection, in the event Serrot International, Inc. determines that the claim is not covered by this Warranty.

- c) NIAGARA COUNTY REFUSE DISPOSAL DISTRICT SHALL NOT REPAIR, REPLACE, REMOVE, ALTER, OR DISTURB ANY GEOCOMPOSITE MATERIAL, NOR SHALL NIAGARA COUNTY REFUSE DISPOSAL DISTRICT ALLOW ANYONE ELSE TO REPAIR, REPLACE, REMOVE, ALTER, OR DISTURB ANY GEOCOMPOSITE MATERIAL PRIOR TO SUCH INSPECTION, OR PRIOR TO RECEIPT OF SERROT INTERNATIONAL, INC.'S NOTICE THAT IT ELECTS NOT TO INSPECT; PROVIDED, HOWEVER, NIAGARA COUNTY REFUSE DISPOSAL DISTRICT MAY TAKE EMERGENCY ACTION NECESSARY TO PREVENT DAMAGE TO PERSONS, PROPERTY OR THE ENVIRONMENT. A FAILURE TO STRICTLY COMPLY WITH THIS PARAGRAPH SHALL VOID THIS WARRANTY.
- d) If it is determined by Serrot International, Inc. that the claim is covered by this Warranty, Serrot International, Inc. shall at its sole discretion either repair the existing geocomposite material or provide new geocomposite material for so much of the geocomposite material as is defective. In the event Serrot International, Inc. repairs the defective geocomposite material or provides new geocomposite material, NIAGARA COUNTY REFUSE DISPOSAL DISTRICT shall pay Serrot International, Inc. a sum equal to the material cost (using the then current sales price of material) multiplied by a fraction, the numerator of which is the number of years, or fraction thereof, which have elapsed since the geocomposite material was manufactured and the denominator of which is the length of this Warranty. THE REMEDIES PROVIDED HEREIN ARE THE EXCLUSIVE REMEDIES AVAILABLE UNDER THIS WARRANTY. Any determination as to whether the claim is covered by the Warranty or what constitutes the appropriate method of remedying a defect will be made by Serrot International, Inc. after consultation with NIAGARA COUNTY REFUSE DISPOSAL DISTRICT.
- e) NIAGARA COUNTY REFUSE DISPOSAL DISTRICT agrees that it shall provide Serrot International, Inc. with clean, dry and unobstructed access to the damaged or defective geocomposite material in order for Serrot International, Inc. to perform the inspections and repairs which may be required pursuant to this Warranty. Serrot International, Inc. shall not be liable for any costs relating to providing access to the geocomposite material.

THE REMEDIES PROVIDED TO NIAGARA COUNTY REFUSE DISPOSAL DISTRICT HEREIN ARE THE EXCLUSIVE REMEDIES AVAILABLE UNDER THIS WARRANTY AND ARE INTENDED FOR THE SOLE BENEFIT OF NIAGARA COUNTY REFUSE DISPOSAL DISTRICT. NEITHER THIS WARRANTY NOR ANY RIGHTS HEREUNDER SHALL BE ASSIGNABLE. SERROT INTERNATIONAL, INC. SHALL HAVE NO LIABILITY UNDER THIS WARRANTY TO THIRD PARTIES. THE WARRANTY SET FORTH ABOVE IS THE ONLY WARRANTY APPLICABLE TO THE GEOCOMPOSITE MATERIAL AND ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL SERROT INTERNATIONAL, INC. BE LIABLE IN CONTRACT, TORT OR OTHERWISE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES FOR, RESULTING FROM, OR IN CONNECTION WITH, ANY LOSS RESULTING FROM THE USE OF THE GEOCOMPOSITE MATERIAL. IN THE EVENT THE EXCLUSIVE REMEDY PROVIDED HEREIN FAILS IN ITS ESSENTIAL PURPOSE, AND IN THAT EVENT ONLY, NIAGARA COUNTY REFUSE DISPOSAL DISTRICT SHALL BE ENTITLED TO RETURN OF THE PURCHASE PRICE FOR SO MUCH OF THE MATERIAL AS SERROT INTERNATIONAL, INC. DETERMINES TO HAVE VIOLATED THE WARRANTY PROVIDED HEREIN.

Except for the Warranty set forth above, no representation or warranty made by any sales or other representative of Serrot International, Inc., or any other person, concerning the geocomposite material shall be binding upon Serrot International, Inc.

Any waiver of the terms and conditions of this Warranty shall be in writing signed by Serrot International, Inc.. The failure to insist upon strict compliance with any of the terms and conditions contained herein shall not act as a waiver of strict compliance with all of the remaining terms and conditions of this Warranty and shall not operate as a waiver as to any of the terms and conditions of this Warranty as to future claims under this Warranty.



The rights and remedies of NIAGARA COUNTY REFUSE DISPOSAL DISTRICT under this Warranty shall not be effective (a) unless payment in full has been made to Serrot International, Inc. for all material covered by this Warranty and (b) until executed by a duly authorized officer of Serrot International, Inc. This Warranty shall be governed by the laws of the State of Nevada. Venue for all legal proceedings in connection with this warranty shall be in Clark County, Nevada, U.S.A.

SERROT INTERNATIONAL, INC.

BY:

A handwritten signature in black ink, appearing to read "Robert A. Otto", written over a horizontal line.

Robert A. Otto, Executive Vice President

I, duly authorized representative of NIAGARA COUNTY REFUSE DISPOSAL DISTRICT, have read and agree to the terms and conditions of this Warranty and agree but for the Warranty provided herein, no other warranties or representations of Serrot International, Inc. have been made by agents or representatives of Serrot International, Inc. and this Warranty supercedes all other documents or agreements concerning the Warranty of the geocomposite material.

BY:

A handwritten signature in black ink, written over a horizontal line.

TITLE:

Chairman

COMPANY:

NCRDD Board

DATE:

11/14/00

CHENANGO CONTRACTING, INC.

LIMITED WORKMANSHIP WARRANTY

Purchaser: NIAGARA CO. REFUSE
DISPOSAL DISTRICT
Address: Niagara Co. Courthouse
Lockport, NY 14094

Project Name: CONSTRUCTION OF CAP SUBGRADE
PERIMETER COLLECTION/BARRIER SYSTEM,
AND FINAL LANDFILL CAP
Address: Wheatfield, NY

Warranty No.: 9905

Project No.: 9905

Effective Date: October 13, 1999

Chenango Contracting, Inc. (CCI) warrants each liner system installed by CCI to be free from defects in workmanship. This "Workmanship Warranty" shall be in effect from the date the installation of the liner system is complete for a period of two years of normal use in approved applications.

This Limited Warranty does not include damages or defects resulting from acts of God, casualty or catastrophe including but not limited to: earthquakes, floods, piercing hail, tornadoes or force majeure. The term "normal use" as used herein does not include, among other things, the exposure of the liner system to harmful chemicals, abuse of the liner system by machinery, equipment or people, excessive pressures or stress from any source, subsurface or overburdened soil conditions, and total or differential soil settlements and the effect these may have on the liner system.

Should defects or premature loss of use within the scope of the above Limited Workmanship Warranty occur, CCI will at its option, repair or replace the liner on a pro-rata basis at the then current price in such manner as to charge the Purchaser/User only for that portion of the warranted life which has elapsed since the purchase of the material. CCI will have the right to inspect and determine the cause of any alleged defect in the liner and to take appropriate steps to repair or replace the liner if a defect exists and is within the terms of this Limited Warranty.

Any claim for any alleged breach of this warranty must be made in writing, by certified mail, to the President of Chenango Contracting, Inc. within thirty (30) days after the alleged defect is first noticed. Should the required notice not be given, the defect and all warranties shall be deemed to have been waived by the Purchaser, and Purchaser shall have no right of recovery against CCI. In the event repairs and/or replacements are to be effected, said repairs and/or replacements shall not become due until the area subject to repair and/or replacement of liner is available to CCI in a clean, dry, unencumbered condition. This includes, but is not limited to, the area made available for repair and/or

replacement of Liner to be free from all water, dirt, sludge, residuals, and liquids of any kind.

CCI's liability under this warranty shall in no event exceed the replacement cost of the material and installation sold to the Purchaser for the particular installation in which it failed. Further, under no circumstances shall CCI be liable for any special, direct, indirect or consequential damages arising from loss of production or any other losses due to personal injuries and product liability owing to failure of the material or installation and no allowance will be made for repairs, replacements, or alterations made by the Purchaser without the express written consent of CCI.

CCI neither assumes nor authorizes any person other than an officer of CCI to assume for it any other additional liability in connection with the Liner system made the basis of the Limited Warranty. The Limited Workmanship Warranty on the Liner herein is given in lieu of all other possible material warranties, either express or implied, and by accepting delivery of the material, Purchaser waives all other possible workmanship warranties except those specifically given.

The parties expressly agree that the sale hereunder is for commercial or industrial use only.

CCI Limited Warranty is extended to the purchaser/owner and is non-transferable and non-assignable. This warranty shall become void in the event payment for installation is not received in full.

Purchaser acknowledges by acceptance that the Limited Workmanship Warranty given herein is accepted in preference to any and all other possible workmanship warranties.

CCI MAKES NO WARRANTY OF ANY KIND OTHER THAN THAT GIVEN ABOVE AND HEREBY DISCLAIMS ALL WARRANTIES, BOTH EXPRESS OR IMPLIED, OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

WARRANTY BECOMES EFFECTIVE UPON RECEIPT OF FINAL PAYMENT.

I hereby state I have read and understood the above and foregoing Limited Warranty and agree to such by signing hereunder.

Purchaser Name:

Signature:

Title: Chairman

Date: 11/14/00

Chenango Contracting, Inc.



Representative

Sworn before me this 21st of Feb, 2000

Donna M. Webster

DONNA M. WEBSTER
Notary Public, State of New York
No. 01WE5034223
Qualified in Broome County
My Commission Expires 10-3-2003

**POLY-FLEX LINER
LIMITED WARRANTY**

Warranty No: 00-54-009

Project No: 980253

Effective Date: February 21, 200

OWNER NAME: Niagara County Refuse Disposal District
ADDRESS: Niagara County Court House
CITY, STATE, ZIP: Lockport, NY 14094-2740

PROJECT NAME: Niagara County Refuse Site
DESCRIPTION: Landfill Closure
ADDRESS: 50 Witnere Road
CITY, STATE, ZIP: North Tonawanda, NY 14120

POLY-FLEX, INC. warrants each POLY-FLEX LINER to be free from defects in materials and to be able to withstand normal weathering from date of installation or sale, whichever occurs first, for a period of 20 years for normal use in approved applications.

This Limited Warranty does not include damages or defects in Poly-Flex Liner resulting from acts of God, casualty or catastrophe including but not limited to: earthquakes, floods, piercing hail, tornadoes or force majeure. The term "normal use" as used herein does not include, among other things, the exposure of Poly-Flex Liner to harmful chemicals, abuse of Poly-Flex Liner by machinery, equipment or people, excessive pressures or stress from any source. Poly-Flex material warranty is intended for commercial use only and is not in effect for the consumer as defined in the Magnuson-Moss Warranty Act or any similar federal, state, or local statutes.

Should defects or premature loss of use within the scope of the above Limited Warranty occur, Poly-Flex, Inc. will, at its option, repair or replace the Poly-Flex Liner on a pro-rata basis at the then current price in such manner as to charge the Purchaser/User only for that portion of the warranted life which has elapsed since purchase of the material. Poly-Flex, Inc. will have the right to inspect and determine the cause of any alleged defect in the Poly-Flex Liner and to take appropriate steps to repair or replace the Poly-Flex Liner if a defect exists and is within the term of this Limited Warranty.

Any claim for any alleged breach of this warranty must be made in writing, by certified mail, to the General Manager of Poly-Flex, Inc. within thirty (30) days after the alleged defect is first noticed. Should the required notice not be given, the defect and all warranties shall be deemed to have been waived by the Purchaser, and Purchaser shall have no right of recovery against Poly-Flex, Inc. In the event repairs and/or replacements are to be effected, said repairs and/or replacements shall not become due until the area subject to repair and/or replacement of Poly-Flex Liner is available to Poly-Flex, Inc. in a reasonably clean, dry, unencumbered condition. This includes, but is not limited to, the area made available for repair and/or replacement of Poly-Flex Liner to be free from all water, dirt, sludge, residuals, and liquids of any kind.

POLY-FLEX, INC. MAKES NO WARRANTY OF ANY KIND OTHER THAN THAT GIVEN ABOVE AND HEREBY DISCLAIMS ALL WARRANTIES, BOTH EXPRESS OR IMPLIED, OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

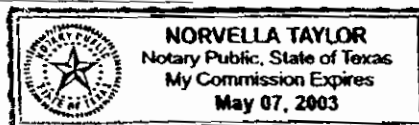
WARRANTY BECOMES EFFECTIVE UPON RECEIPT OF FINAL PAYMENT

I hereby state I have read and understood the above and foregoing Limited Warranty and agree to such by signing hereunder.

PURCHASER NAME: _____
SIGNATURE: [Signature]
TITLE: Chairman
DATE: 11/14/00

POLY-FLEX, INC. [Signature]
General Manager

Sworn before me this 21st day of February, 20 00



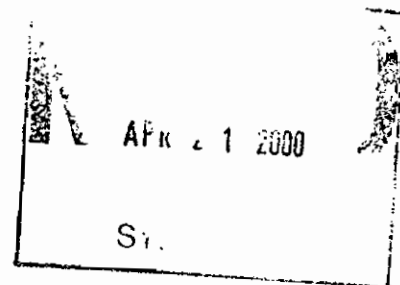
PMP

PARSONS ENGINEERING SCIENCE, INC.

1000 Lehigh Valley Blvd. Suite 100 • Williamsport, New York 16721 • (716) 633-7074 • Fax: (716) 633-7195

April 19, 2000

Mr. Richard Pope, Director
Niagara County Refuse Disposal District
Niagara County Courthouse
Lockport, New York 14094



RE: Haseley's Guarantee for Niagara County Refuse Site

Dear Mr. Pope:

Haseley has completed the attached IB-45 Form of Guarantee, as required by the contract documents. The guarantee period starts on 1/25/2000 for the completed and acceptable work.

Also, I have attached the uncompleted items list, updated 1/26/2000. The one-year guarantee has not started for these items.

Call me at (716) 633-7074 if you have any questions or need additional information.

Very truly yours,

PARSONS ENGINEERING SCIENCE, INC.

James R. Cowe
Construction Manager

cc: Project File 733549 #9b
J. Kyles, Parsons ES Buffalo
P. Petrone, Parsons ES Syracuse
T. Santarsiero, Haseley Construction

COUNTY OF NIAGARA

NIAGARA COUNTY REFUSE DISPOSAL DISTRICT

SECTION 1.7 - FORM OF GUARANTEE

DATE: April 12, 2000

Contractor: Haseley Construction Company, Inc.

Owner: COUNTY OF NIAGARA

Gentlemen:

The undersigned guarantees the workmanship for the Construction of Subgrade, Perimeter Collection Barrier System and Final Landfill Cap under its Contract dated June 16, 1998 with the COUNTY OF NIAGARA and change orders thereto, be in accordance with drawings and specifications prepared by the NIAGARA COUNTY REFUSE DISPOSAL DISTRICT - COUNTY OF NIAGARA including approved modifications to said drawings and specifications, and to be free from imperfect workmanship and/or materials.

Furthermore, the undersigned agrees to repair at its own expense, for a period of one (1) year from the date of completion and acceptance by the COUNTY, all of the work completed and covered under said Contract and Change Orders, that may prove defective.

Furthermore, the undersigned also agrees to pay the cost of repairing all damages to other work resulting from the defects in its own work and to pay the cost of replacing other work which the undersigned may disturb in making good defects in its own work.

It is also understood that COUNTY OF NIAGARA and/or Engineer shall give notice of observed defects with reasonable promptness, and all questions arising under this guarantee shall be decided by the COUNTY OF NIAGARA.

All corrections to defective work are to be done promptly and at the convenience of the Owner. Access to the work is to be scheduled by the Owner during normal working hours.

Guarantee Period starts January 25, 2000

Haseley Construction Company, Inc.

(Contractor)

By Mark M. Haseley

Mark M. Haseley - President

Witness: [Signature]

APR 15 2000
JN

SECTION E1
EQUIPMENT SUPPLIERS

Niagara County Landfill

Equipment Supplier List

<u>Item</u>	<u>Manufacturer</u>	<u>Supplier</u>	<u>Representative</u>
1. Motor Control Center	Cutler-Hammer	Niagara County	Mr. Jerry Moskal Cutler-Hammer 716-691-4333
2. Line Metering System	Cutler-Hammer	Niagara County	Mr. Jerry Moskal Cutler-Hammer 716-691-4333
3. Mini-Power Center	Cutler-Hammer	Shanor Electric Mr. Joe Smith 716-876-0711	Mr. Jerry Moskal Cutler-Hammer 716-691-4333
4. Fire / Security System	FBI, Inc.	Life Safety Mr. Robert Visina 716-656-8890	Life Safety Mr. Robert Visina 716-656-8890
5. Wet Well Float Switches	Warrick	RL Stone Mr. Heifler 716-834-2525	RL Stone Mr. Heifler 716-834-2525
6. Ground Rod Inspection Units	Kistner Concrete	Kistner Concrete Mr. Clarence 716-762-8216	Kistner Concrete Mr. Clarence 716-762-8216
7. Exhaust Fan	Aeroflo Inc.	Aeroflo Inc. Mr. Warren DiMarco 519-884-0510	Aeroflo Inc. Mr. Warren DiMarco 519-884-0510
8. Lighting Fixtures	Various	Shanor Electric Mr. Joe Smith 716-876-0711	Shanor Electric Mr. Joe Smith 716-876-0711
9. Unit Heater	Markel	Shanor Electric Mr. Joe Smith 716-876-0711	Shanor Electric Mr. Joe Smith 716-876-0711
10. Junction-Pull Boxes	Crouse-Hinds	Graybar Electric Mr. Mike Teplitsky 716-854-3700	Crouse-Hinds Mr. Frank Suozzi 716-681-4341
11. Exhaust Fan Starter	Sq-D	Anderson Electric Mr. Fred Metro 716-283-2030	SQ-D Mr. Jeff Crick 716-565-1000

SECTION E2
MOTOR CONTROL CENTER

Part 1

GENERAL INFORMATION

THE MOTOR CONTROL CENTER

The Cutler-Hammer Freedom 2100 Motor Control Center may be joined to existing Five Star, Series 2100, and Advantage installations using the splice bar kits common to both. Units designed for the Freedom 2100 can be mounted in Five Star Series and Series 2100 sections, but the opposite is not recommended, because Five Star and Series 2100 units may lack terminal blocks and sufficient interrupting capacity. The Freedom 2100 MCC may be joined to existing Cutler-Hammer Freedom Unitrol and F10 Unitrol MCC's with a special splice bar kit, but units are not interchangeable.

CONTROL CENTER NOMENCLATURE

The numbers shown in parentheses in the following text refer to the balloon legends in Figure 2.

The Cutler-Hammer Freedom 2100 Motor Control Center consists of one or more totally enclosed, dead front, free standing structural assemblies (17) 90 inches high which are compartmentalized to house individual control units. (2) With control units mounted in the front side only, the structure may be 16 or 21 inches deep. For mounting units back-to-back, the structure is 21 inches deep. Steel covers (7) enclose the structure at the top, sides and at the rear of front-mounted-only structures.

A vertical bus system (8) installed in each vertical section is connected to the horizontal bus to feed the individual control units. (6) The vertical bus is isolated by a full height barrier. (14) An optional labyrinth barrier provides both isolation and insulation. An automatic shutter is included with the labyrinth barrier system to cover the stab openings for each control unit.

At the top of each section, a door provides ready access to the top horizontal wireway (11) and ground bus (10). The horizontal wireway is isolated from the bus systems by steel barriers (12) which can be removed for installation and maintenance operations. Adequate space is provided for control wiring and top cable entry.

At the bottom of each section, a door (18) provides ready access to the bottom horizontal wireway, (19) and neutral bus (if provided). The bottom of each section is completely open to provide unrestricted bottom entry of cable and conduit. Channel sills may be installed across the bottom of the control center if specified, and an optional bottom plate may also be specified.

A vertical wireway 8 inches deep, (16) extending the

full 90 inch height of the control center is located to the right of each unit compartment. This wireway is covered by two hinged doors (15) and contains cable supports to secure wire bundles and cables. The vertical wireway joins the horizontal wireway at top and bottom to provide unobstructed space for interwiring.

Each vertical section provides space to mount up to six controller units (2) with a minimum height of 12 inches, in increments of six inches, for a total of 72 inches of usable space. Controllers through NEMA Size 5 are drawout type (except reduced-voltage starters). These drawout unit assemblies are a completely self-contained package consisting of a steel enclosure, operating handle and electrical components. The drawout assembly slides into its compartment on guide rails (13) to provide easy withdrawal and reinsertion and to ensure precise alignment of the unit stabs with the vertical bus. Each drawout unit is held in place by a single quarter-turn latch (3) which can only be engaged when the unit stabs are fully mated with the vertical bus. Each unit has a separate door, (1) held closed by a minimum of two quarter-turn fasteners.

The operating handle on the controller unit (4) moves vertically. In the ON or TRIPPED positions, the handle interlocks with the unit door to prevent its opening. In this position, authorized personnel can open the door by turning the defeater mechanism screw. (21) With the unit door open and the operating handle in the ON position, another interlock to the divider pan prevents removal of the unit. This same interlock prevents insertion of the unit unless the handle mechanism is in the OFF position. To ensure that units are not energized accidentally or by unauthorized personnel, the handle mechanism can be padlocked in the OFF position. Space for a minimum of

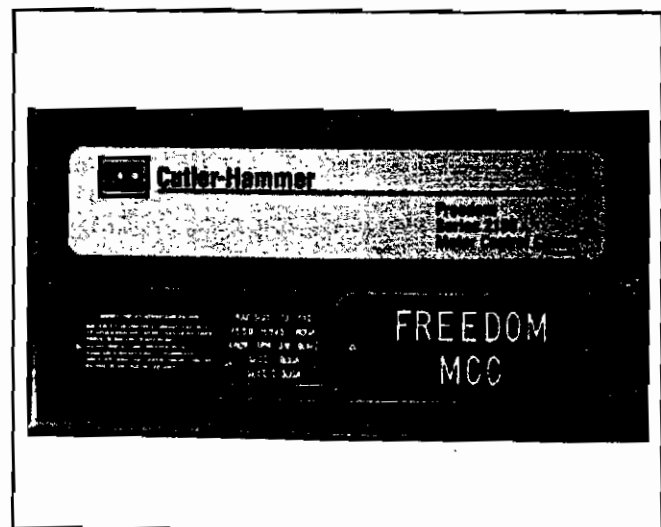


Fig. 1 Nameplate



Freedom 2100 Motor Control Center Installation and Maintenance Manual

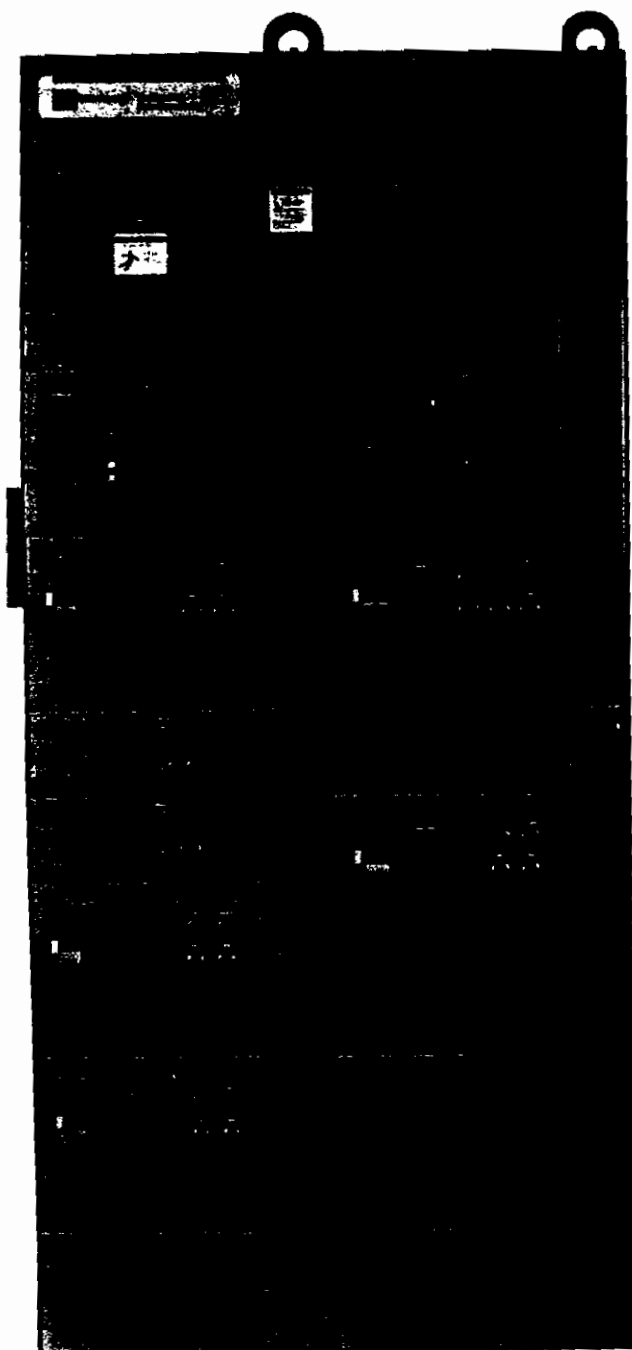


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This electrical control equipment is designed to be installed, operated, and maintained by adequately trained workmen. These instructions do not cover all details, variations, or combinations of the equipment, its storage, delivery, installation, check-out, safe operation, or maintenance. Care must be exercised to comply with local, state, and national regulations, as well as safety practices, for this class of equipment. The maximum short circuit capability of the equipment should not be exceeded by connection to a source with higher capacity.

If maintenance or troubleshooting assistance is required, contact your nearest Cutler-Hammer Sales Office.

NAMEPLATES

Each Freedom 2100 Motor Control Center has a rating nameplate attached to the door of the top horizontal wireway of the primary section. See Figures 1 and 2. This nameplate shows the general order number under which the motor control center was built and its continuous electrical ratings, in terms of incoming line voltage, phases, and frequency, and ampere ratings of the horizontal bus and the vertical bus for each section. In addition, this nameplate shows the passive short-circuit (withstand) rating of the horizontal and vertical bus system.

The active short-circuit (interrupting) ratings of the main and unit short-circuit protective devices are shown on labels attached to the inside of each unit. Before installing a motor control center, calculate and record the fault current available at the incoming line terminals. Verify that the short-circuit withstand and short-circuit interrupting ratings of the units in the motor control center are appropriate for the fault current available.

QUALIFIED PERSONNEL

Individuals who install, operate or maintain motor control centers must be trained and authorized to operate the equipment associated with the installation and maintenance of a motor control center, as well as the operation of the equipment that receives its power from controller units in the motor control center.

Such individuals must be trained in the proper procedures with respect to disconnecting and locking OFF power to the motor control center, wearing protective clothing and equipment, and following established safety procedures as outlined in the *National Electrical Safety Code (ANSI C2)* and *Electrical Equipment Maintenance (NFPA 70B)*.

Part 2 RECEIVING, HANDLING AND STORAGE

RECEIVING

Before and after unloading the motor control center, inspect each section and unit exterior for evidence of damage that may have been incurred during shipment. If there is any indication that the control center has been mishandled or shipped on its back or side, remove the drawout units and make a complete inspection of the internal structure, bus bars, insulators and unit components for possible hidden damage. Report any damage found to the carrier at once.

HANDLING

The following guidelines are provided to help avoid personal injury and equipment damage during handling, and to facilitate moving the motor control center at the job site.

GENERAL HINTS

1. Handle the motor control center with care, to avoid damage to components and to the enclosure or its paint finish.
2. Keep the motor control center in an upright position.
3. Insure that the moving means has the capacity to handle the weight of the motor control center.
4. The control center should remain secured to the shipping skid until the motor control center is in its final location.

5. Exercise care during any movement and placement operations to prevent falling or unintentional rolling or tipping.
6. Lifting angles for handling by overhead crane are bolted to the top of each shipping section. Handling by overhead crane is preferable but when crane facilities are not available, the motor control center can be positioned with a fork-lift truck or by using rollers under the shipping skid.

OVERHEAD CRANE

1. See Figure 3 for recommended lifting configuration.
2. Select or adjust the rigging lengths to compensate for any unequal weight distribution, and to maintain the motor control center in an upright position.
3. To reduce tension on the rigging and the compressive load on the lifting angles, do not allow the angle between the lifting cables and vertical to exceed 45 degrees.
4. Use slings with safety hooks or shackles. **Do not pass ropes or cables through lifting angle holes.**
5. After removing the lifting angles, replace the mounting hardware to prevent the entrance of dirt, etc.

FORK-LIFT TRUCK

Motor control centers are normally top and front heavy. Balance the load carefully and steady, as nec-

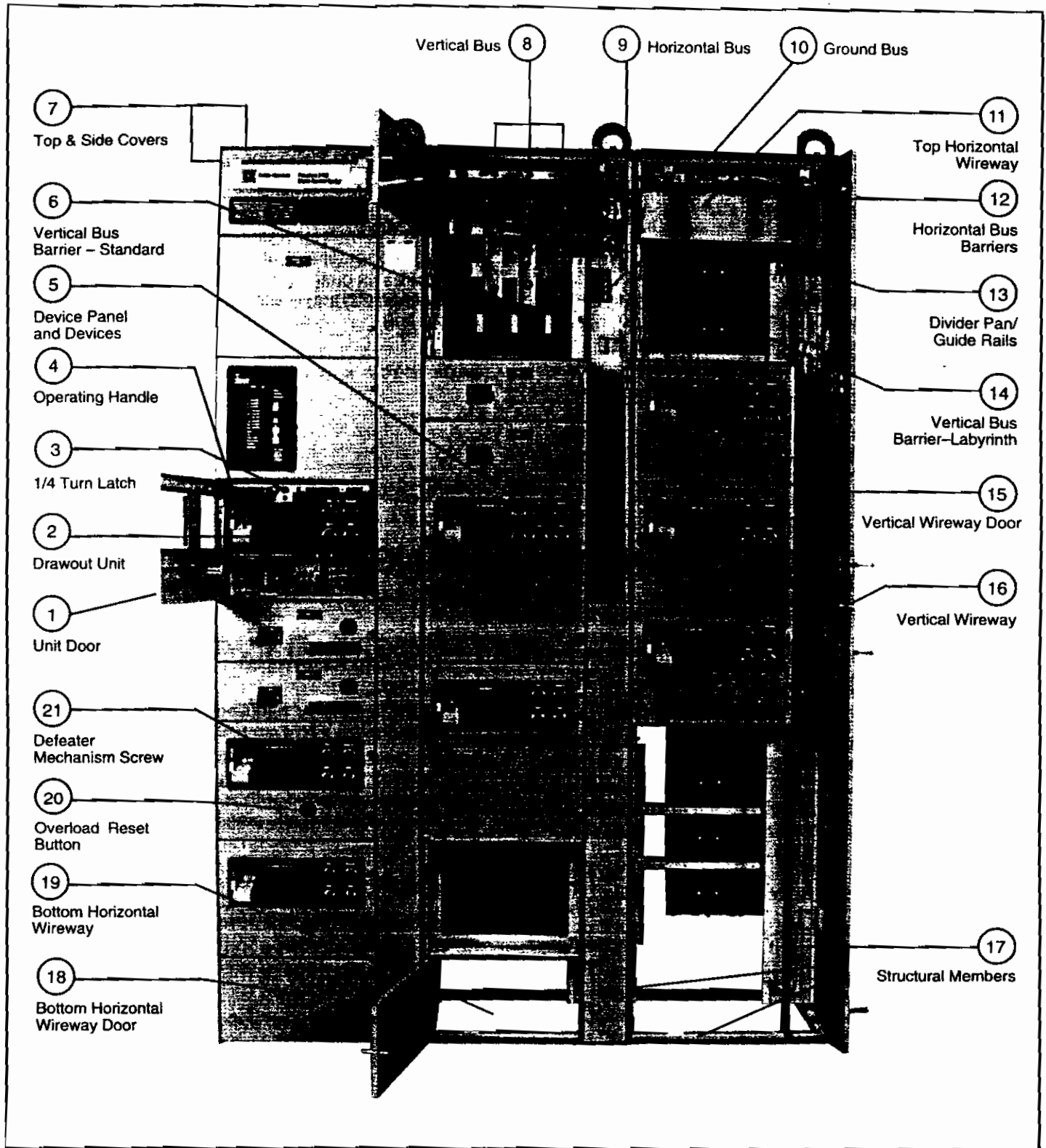


Fig. 2 Motor Control Center Nomenclature

three padlocks is provided on each handle.

The device panel (6) is mounted on the drawout unit. It will accommodate up to six pilot devices. The overload

reset button (20) is mounted on the unit door.

INSTALLATION (Cont.)

mounted on a level surface. The foundation furnished by the purchaser must be true and level, or the bottom frames must be shimmed to support the entire base in a true plane. It is recommended that leveled channel sills under both the front and rear of the control center be used to provide this level base. Drill and tap the channel sills for mounting bolts in accordance with the applicable floor plan drawing and then either install the MCC level with, or on top of, the finished floor. If sills are grouted in concrete, the mounting bolts should be screwed in place and remain until the concrete has hardened.

4. For bottom entry, position the motor control center so that the conduit stubs or floor openings are located in the shaded areas shown on the MCC floor plan drawings (refer to pages 30 and 31 for floor plan dimensions). The shaded areas represent the open space available for conduit entry through the bottom of each section. A shaded area may be restricted if large controllers or autotransformers are mounted in the bottom of the sections. If optional bottom plates are supplied, the plates may be removed and drilled for conduit entry.
5. Install the MCC in its final position, progressively leveling each section and bolting the frames together if they are separated. If necessary, secure the MCC to walls or other supporting surfaces. Do not depend on wooden plugs driven into holes in masonry, concrete, plaster, or similar materials. See NEC 110-13.
6. If two or more shipping sections are to be joined into an integral assembly or a shipping section is to be joined to an existing section, refer to paragraphs below before proceeding with the installation.
7. Ground and bond the motor control center as follows:
 - a) Motor control centers used as service equipment for a grounded system or as an incoming line section for a separately-derived previously grounded system:
 - i) Run a grounding electrode conductor (ground wire) having a size in accordance with NEC 250-94 from the grounding electrode to the MCC ground bus or ground terminal provided. See also NEC 250-91(a) and 92(b).
 - ii) If the system is grounded at any point ahead of the MCC, the grounded conductor must be run to the MCC in accordance with NEC 250-23(b), and connected to the ground bus terminal.
 - iii) Do not make any connections to ground on the load side of any neutral disconnecting line or any sensor used for ground-fault protection. Do not connect outgoing grounding conductors to the neutral.
 - b) Motor control centers used as service equipment

for an ungrounded system or as an incoming line section for a separately-derived previously ungrounded system:

- i) Run a grounding electrode conductor (ground wire) having a size in accordance with NEC 250-94 from the grounding electrode to the MCC ground bus terminal. See NEC 250-91(a) and 92(b).
- c) Motor control centers not used as service equipment nor as an incoming line section for a separately-derived system, and used on either a grounded or ungrounded system:
 - i) Ground the MCC ground bus by means of equipment grounding conductors having a size in accordance with NEC 250-95 or by bonding to the raceway enclosing the main supply conductors in accordance with NEC 250-91(b).
8. When all wiring and adjustments are complete, close all unit and wireway doors.
9. In damp indoor locations, shield the MCC to prevent moisture and water from entering and accumulating.
10. Unless the motor control center has been designed for unusual service conditions, it should not be located where it will be exposed to ambient temperatures above 40°C (104°F), corrosive or explosive fumes, dust, vapors, dripping or standing water, abnormal vibration, shock or tilting.

JOINING COMPATIBLE SECTIONS

If two more shipping blocks are to be joined into an integral assembly, or a section added to an existing installation, splicing or horizontal bus, ground bus, neutral bus and joining of the adjacent vertical sections must be planned with the installation.

1. Remove the side sheets from adjacent vertical sections to be joined. (These sheets will have been removed from factory-assembled sections.)
2. The horizontal bus splice plates and connection hardware will be shipped with the MCC attached to one end of shipping section. Refer to Figure 4. This method provides the most convenient access to the bolts, and eliminates the need to remove the horizontal bus barriers in that structure. Should the existing bus be oxidized, sand lightly with a fine aluminum oxide paper. **CAUTION** — Do not use emery cloth or any abrasive containing metal.
3. Remove the upper horizontal wireway door from the structure on the right side of the left-hand (LH) section and remove the two-piece wireway barrier to provide access to the ends of the bus in that section.
4. Move the section in place, aligning the upright structural channels and bottom channels. Alignment of the section with floor sills and foundation provisions will

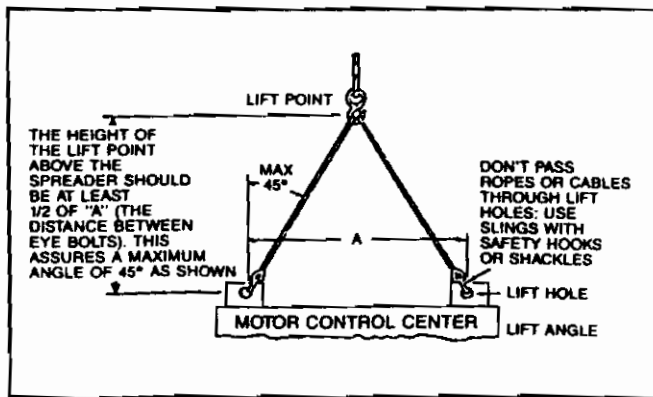


Fig. 3 Correct Use of Lifting Angle

essary, while moving. **Always use a safety strap when handling with a fork-lift.**

ROLLERS

Rod or pipe rollers, with the aid of pinch bars, provide

a simple method of moving the motor control center on one floor level, if there is no significant incline. Roll the motor control center slowly, and steady the load to prevent tipping.

STORAGE

When a motor control center cannot be installed and placed into operation immediately upon receipt, take steps to prevent damage by condensation or harsh environmental conditions. If the motor control center cannot be installed in its final location, store it in a clean, dry, ventilated building, heated to prevent condensation, and protected from dirt, dust, water, and mechanical damage. When storage conditions are less than ideal, install temporary electrical heating, typically in the form of light bulbs, totaling 150 watts per section, hung in the vertical wireway, or by applying power to self-contained space heaters that the motor control center may be equipped with. Remove all loose packing and flammable materials before energizing any of the heating elements.

Part 3 INSTALLING CONTROL CENTER SECTIONS

GENERAL

Freedom Series 2100 Motor Control Centers (MCC's) are designed for installation in accordance with both the *National Electrical Code (NEC)*, *NFPA 70*, and the *National Electrical Safety Code (NESC)*, *ANSI C2*.

Caution — If work is involved in connecting the control center with existing equipment, ensure that incoming power is disconnected before work is begun. Disconnecting means should be locked out and/or tagged out of service. Where it is not feasible to de-energize the system, the following precautions should be taken:

A) Persons working near exposed parts that are or may be energized should be instructed and should use practices (including appropriate apparel, equipment, and tools) in accordance with the NESC.

B) Persons working on exposed parts that are or may be energized should, in addition, be qualified persons who have been trained to work on energized circuits.

INSTALLATION

1. Before any installation work is begun, consult all

drawings furnished by Cutler-Hammer as well as all applicable contract drawings for the installation. Give particular attention to the physical location of units in the control center and their relation to existing or planned conduit, busways, etc. Provide for future conduit entrance prior to control center installation.

2. Locate the control center in the area shown on the building floor plans. If in a wet location or outside of the building, protect the control center from water entering or accumulating within the enclosure. Recommended clearances or working spaces are as follows:
 - a) Clearance from walls (where not rear accessible) — a minimum of 1/2 inch for indoor and 6 inches for outdoor or wet locations.
 - b) Clearance from front of MCC (working space) — minimum of 3 feet for control centers without exposed live parts. See NEC 110-16d. **NOTE:** This working space should not be used for storage and should have adequate lighting.
3. Since control centers are assembled at the factory on smooth and level surfaces to assure correct alignment of all parts, control centers should be securely

SPLICE PLATES (Cont.)

splice plate is punched with rectangular holes to accept a square shank carriage bolt that will not rotate as the nut is tightened.

Where the MCC is built with two horizontal bus bars per phase, the splice plates are installed as shown in Figure 7. The top edge of Figures 7 through 10 represents the back side of the MCC. The top portion of each of these figures applies to 20" deep enclosures and the lower portion to 16" deep enclosures. Note that for all but the single-bar per phase (Figure 6) installation, the

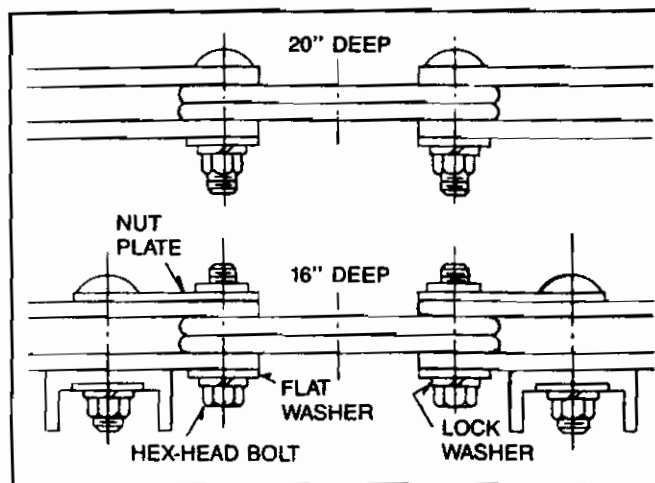


Fig. 7 Double Bar Splice Kit

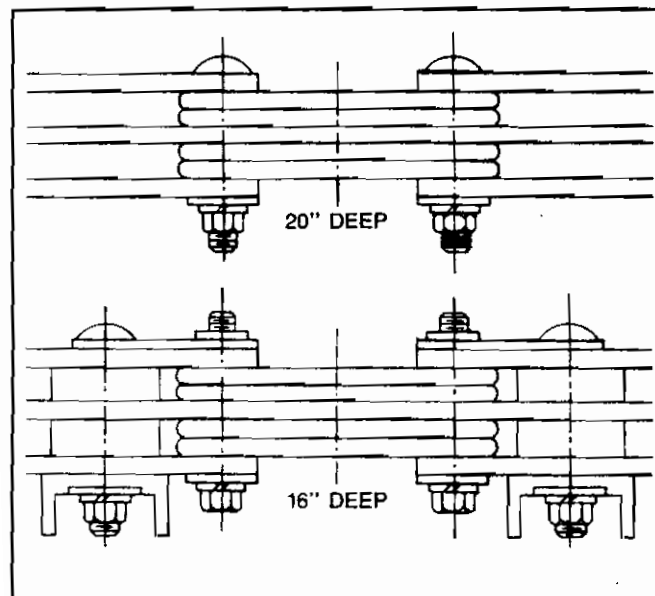


Fig. 8 Triple Bar Splice Kit

16" deep enclosures require the use of a nut plate that is mounted with the same carriage bolt used to attach the horizontal bus bars to the channel-shaped insulators. Install these nut plates before mounting the splice plates. Tighten the splice plate bolts with a driving torque of 360 pound-inches (30 pound-feet).

TYPE 3R ENCLOSURES

Where the MCC is supplied in a Type 3R enclosure for an outdoor application, apply roof splice caps at each shipping block junction to maintain the enclosure integrity.

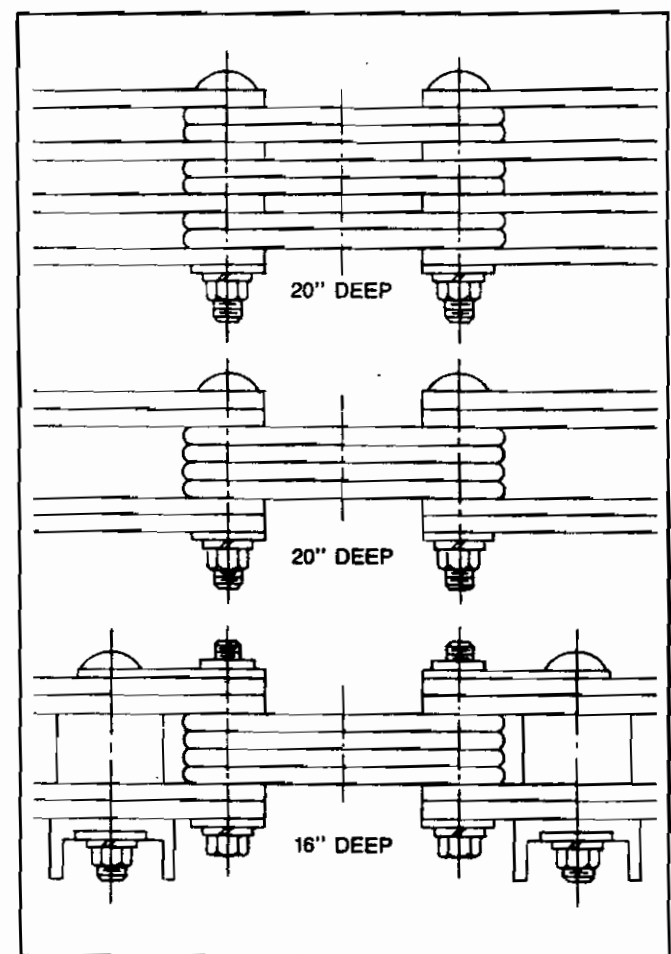


Fig. 9 Quadruple Bar Splice Kits

be facilitated by removing the bottom horizontal wireway doors. Using the "U" type frame clamps provided, clamp adjacent front upright channels together at the top, bottom and approximate center of the vertical structure. This operation will be facilitated by removing the vertical wireway doors from the left-hand structure and one or more drawout units from the right-hand structure. See Part 9.

5. If rear access is available, "U" clamps should also be used to clamp the rear upright channels together. In front-mounted-only structures this will require removal of the adjacent back sheets. In a back-to-back mounted structure, remove the vertical wireway doors and one or more drawout units as above.
6. Secure the sections to the floor sills or mounting bolts as provided for the installation.
7. Bolt the horizontal bus splice plates to the bus in the left-hand structure, torquing all bus splice bolts to 360 pound-inches (30 pound-feet). See Figure 5.
8. Replace all unit, bus barriers, and doors.

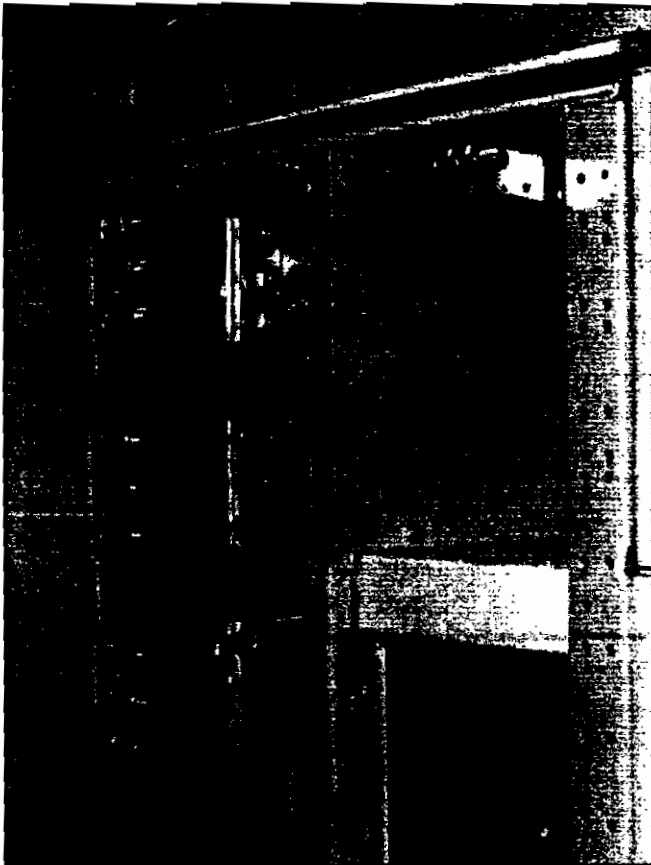


Fig. 4 Splice Plates Attached to RH Section



Fig. 5 Access to LH Splice Plate Connections

JOINING INCOMPATIBLE SECTIONS

Joining a Freedom 2100 Motor Control Center to other equipment such as Type W and 11-300 Control Centers will usually involve a transition section, installed between the two varieties of equipment. This transition section will be detailed on drawings provided by Cutler-Hammer and the applicable contact drawings. If provided separately, it should be installed first. Review the overall installation task to determine whether the transition section should be attached to the existing equipment or to the Freedom 2100 section, before it is moved into place, and select the sequence which will provide best access to bus splicing and joining of the structures.

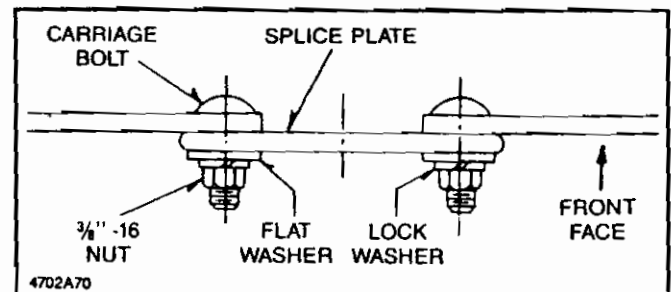


Fig. 6 Single Bar Splice Kit

SPLICE PLATES

Each splice plate kit consists of short pieces of bus bar the same width as the main horizontal bus of the MCC the kit is shipped with, four bolts per phase, and appropriate quantities of related hardware. For a single bus bar per phase the hardware is used as shown in Figure 6 for either 16" or 20" deep enclosures. Each

JOINING FREEDOM 2100 TO FREEDOM UNITROL OR F10 UNITROL (cont.)

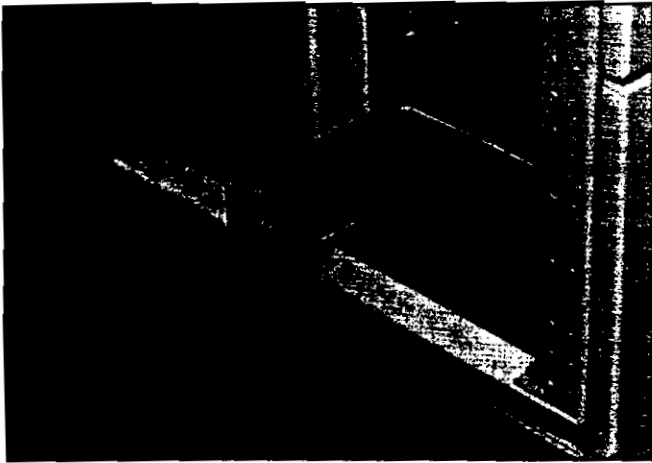


Fig. 13 Splice Plate Attached to Freedom 2100 – Ground Bus at Bottom.

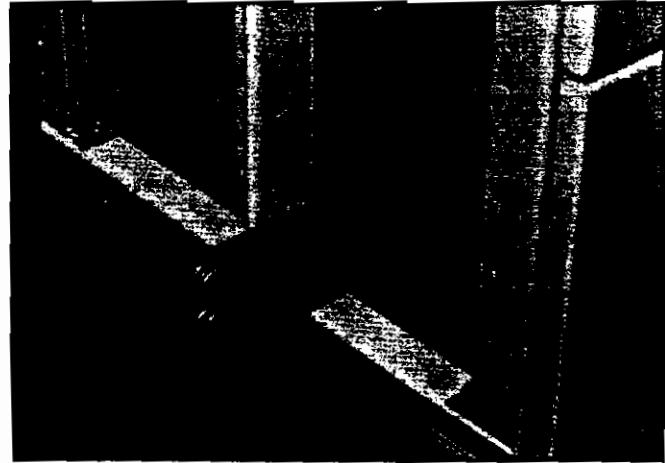


Fig. 14 Splice Plate Attached to Freedom 2100 – Neutral Bus.

Part 4

INSTALLING CONDUIT AND WIRING

CONDUIT

Install conduit in such a manner as to prevent water from entering and accumulating in the conduit or the enclosure. Eliminate sags in conduit. Have the conduit enter the motor control center (MCC) in the areas designated for conduit entry on the plan views. See pages 30 and 31 of this booklet and outline drawings shipped with the MCC. Keeping conduit within the shaded areas shown in the plan views will avoid cable interference with structural members and live bus. (See Part 12.)

WIRING

Install the line and load conductors sized in accordance with the NEC. **Use copper wire only for control terminations. Use copper wire only for power terminations unless they are marked "CU/AL."** Use conductors with a temperature rating of 75°C or higher, but regardless of the insulation temperature rating select the wire size on the basis of 75°C wire ampacity. Using a higher temperature wire ampacity table often results in

a smaller cross-section of copper available for carrying heat away from terminals.

Install insulated wire and cable at a temperature sufficiently warm to prevent the insulation from cracking or splitting.

When more than one conduit is run from a common source or to a common load, be sure to have each conduit carry conductors from each phase and the same number of conductors per phase. If the phase conductors are not distributed uniformly, eddy currents will be generated in the steel between the conduits.

Locate conductors within the MCC to avoid physical damage and to avoid overheating. Secure incoming power lines in a manner adequate to withstand the forces which will act to separate the conductors under short-circuit conditions. Use the cable ties furnished in both horizontal and vertical wireways to support the load and interconnection wire. Use a shielded communications cable inside of flexible metal conduit to protect very low voltage signals transmitted to or from a computer or programmable controller.

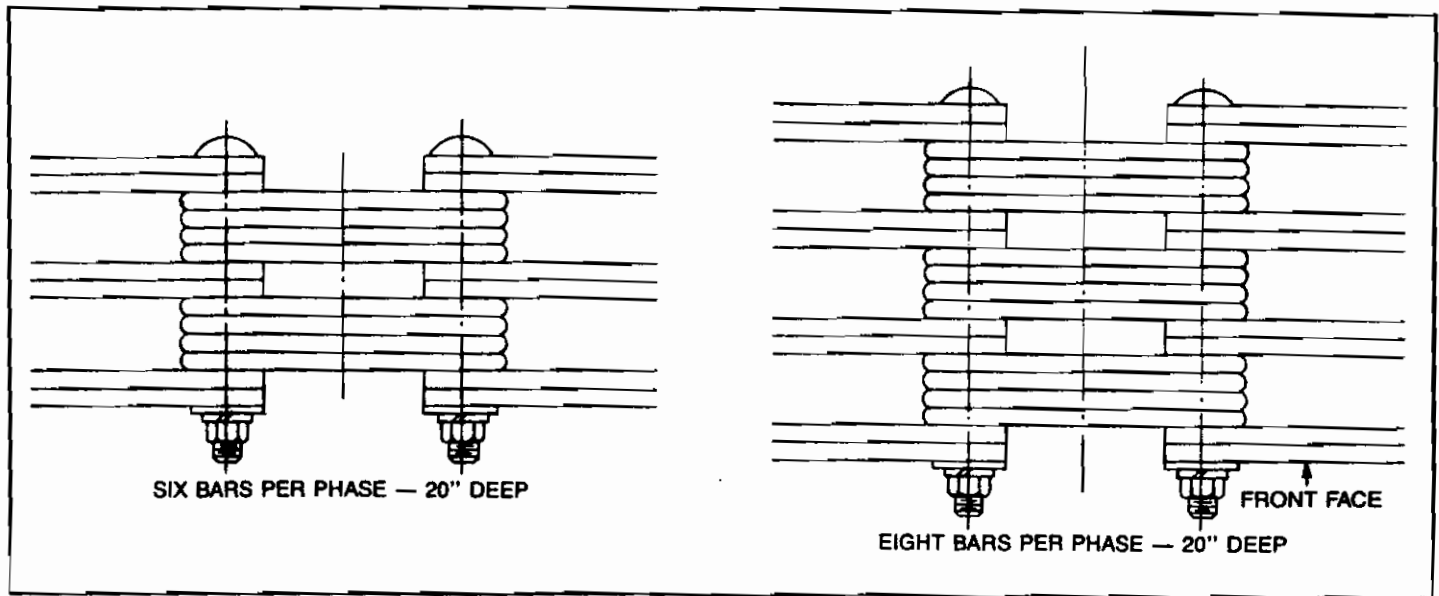


Fig. 10 Six and Eight Bar Splice Kits

JOINING FREEDOM 2100 TO FREEDOM UNITROL OR F10 UNITROL

Consult the assembly instructions supplied with every Freedom 2100 Motor Control Center set up for splice to Freedom Unitrol or F10 Unitrol.

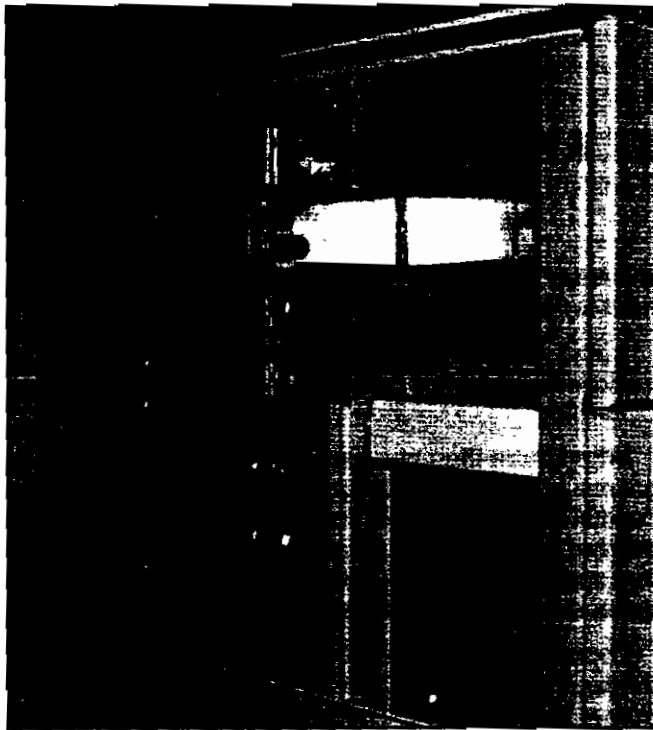


Fig. 11 Splice Plates Attached to Freedom 2100 — Horizontal Bus and Ground Bus at Top.

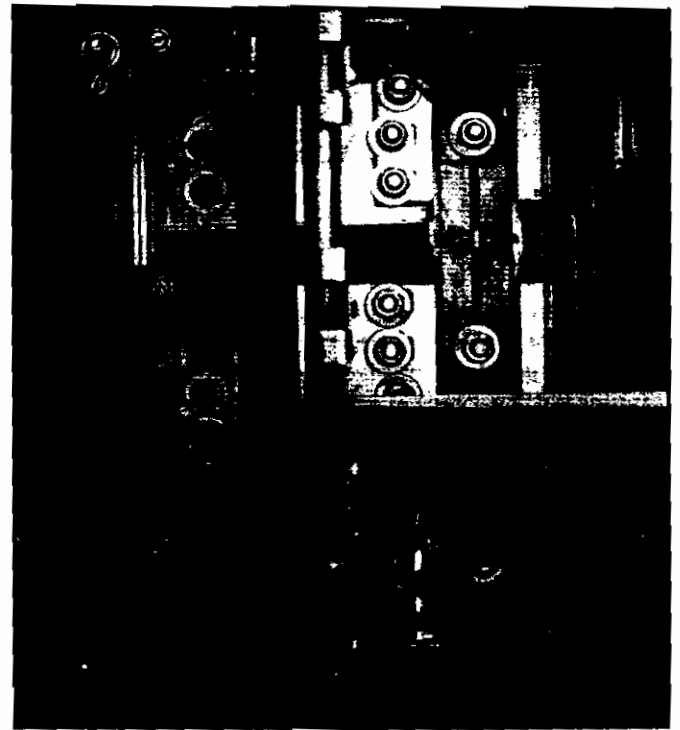


Fig. 12 Horizontal Bus Splice Freedom Unitrol on Left, Freedom 2100 on Right.

Part 5 INCOMING LINE CONNECTIONS

OVERCURRENT PROTECTION

All ungrounded conductors in a motor control center (MCC) installation require some form of overcurrent protection in order to comply with Section 240-20 of the NEC. Such overcurrent protection for the incoming lines to the MCC is in the form of fuses or a circuit breaker located at the transformer secondary that supplies the MCC. The conductors from the transformer secondary constitute the feeder to the MCC, and the "10-foot rule" and the "25-foot rule" of NEC 240-21 apply. These latter exceptions to the general rule allow the disconnect means and overcurrent protection to be located in the MCC, provided the feeder taps from the transformer are sufficiently short and other requirements are met.

MAIN DISCONNECTS

A circuit breaker or a circuit interrupter combined with fuses controlling the power to the entire MCC may provide the overcurrent protection required as described above or may be a supplementary disconnect (isolation) means. See Figures 17, 18 and 19.

When the MCC has a main disconnect, bring the incoming lines (the feeders) to the line terminals of the circuit breaker or circuit interrupter. The load side of the

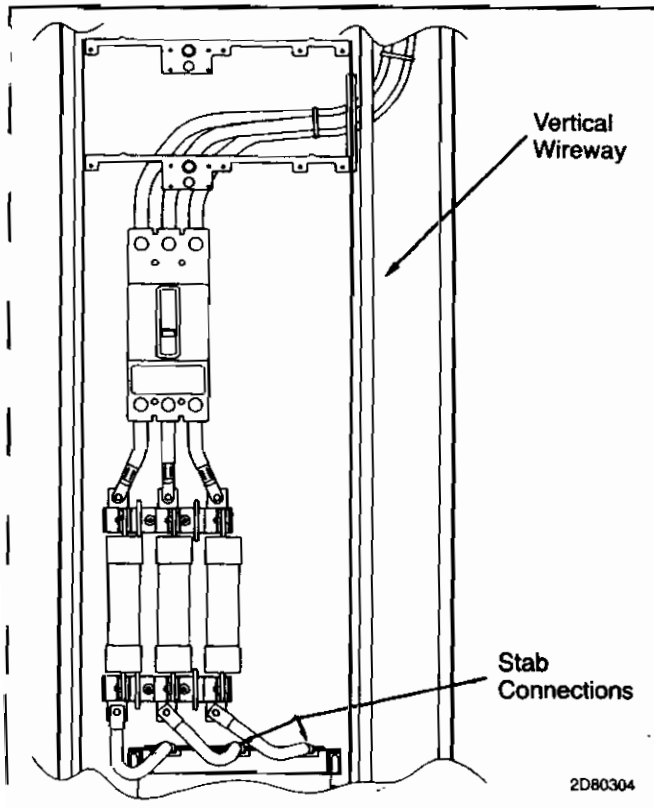


Fig. 17 Main Disconnect with Stab Load Connections

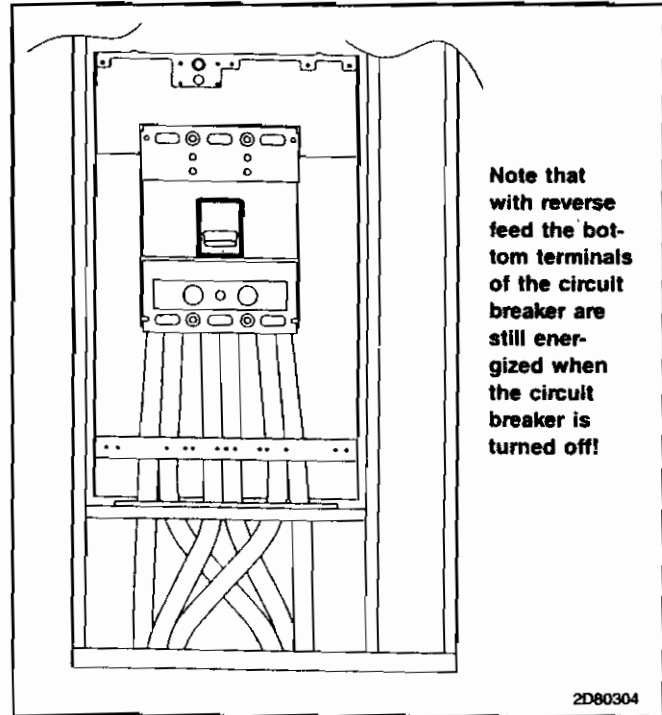


Fig. 18 Main Circuit Breaker with Reverse Feed

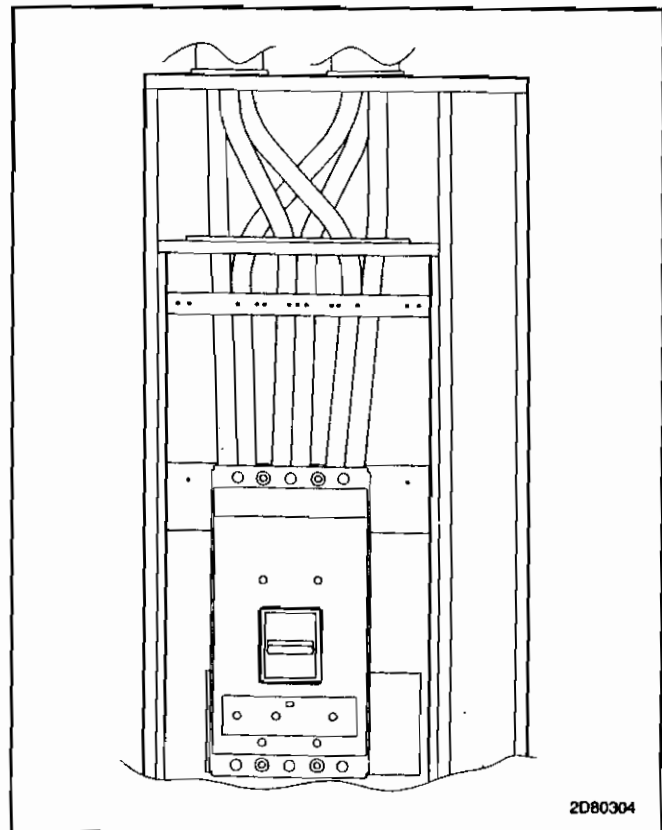


Fig. 19 Main Circuit Breaker

Lugs furnished with the MCC and its components are for Class B and Class C stranding. Verify the compatibility of wire size, type, and stranding with the lugs furnished. Where they are not compatible, change the wire or lugs accordingly. If crimp lugs are used, crimp with the tools recommended by the manufacturer.

Use care in stripping insulation to avoid nicking or ringing the metal.

All field wiring to control units should be made in accordance with the wiring drawings that are furnished with the control center. Load and control wiring can be brought in through the upper and/or lower horizontal wireways. Determine the type of wiring installed in the control center (NEMA Type B or C) and proceed per the appropriate paragraph below.

The phase sequence of the power circuit load terminals (left-to-right: T1, T2, T3) in units mounted on the rear side of the MCC is opposite to that of the load terminals in units mounted on the front side of a back-to-back MCC. To obtain the same direction of rotation for a motor connected to a rear-mounted unit as for one connected to a front-mounted unit, relabel the terminals in the rear-mounted unit: T3, T2, T1, and wire accordingly. Refer to the warning sticker supplied with rear-side units.

When making connections to the load terminals be sure to leave sufficient slack in the wires so that the unit can be withdrawn to the detent position for maintenance. See page 20.

NEMA TYPE B WIRING

Each control unit is factory assembled with devices interwired within the unit. In addition, all control wiring is carried to unit terminal blocks mounted on the right-hand side of the unit. See Figure 15. Bring the field wiring of control wires from a horizontal wireway into the vertical wireway on the right-hand side of the applicable control unit and terminate them at the unit terminal blocks. Bring load wiring from the vertical wireway, under the bottom right-hand side of the unit, to terminations within the unit. See below.

ENGAGING PULL-APART TERMINAL BLOCKS

The male portion of the pull-apart terminal block is located in a plastic bag tied to the pivot rod inside the unit. This terminal block can be wired outside of the vertical wireway. To engage the terminal block, align the fingers of the male connector with the slot at the back of the female portion of the terminal block. Then rotate the male portion forward and to the left into the female portion of the terminal block.

Each male portion of the pull-apart terminal block has two cavities adjacent to the center terminal screw to accept the blade of an electrician's screwdriver used to cam the block into and out of engagement. Each male

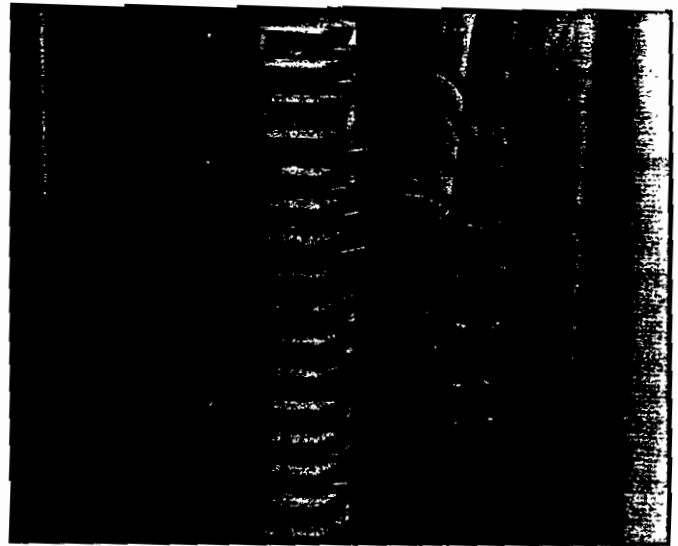


Fig. 15 Unit Terminal Blocks

portion also has a rear slot that can engage the edge of the unit frame where it can be mounted for ease in trouble-shooting.

NEMA TYPE C WIRING

Each control unit is factory assembled with devices interwired within the unit. In addition, all control wiring is carried to unit terminal blocks on the side of the unit and from these unit blocks, along with load wiring through Size 3, to master terminal blocks located at the top or bottom of the structure. See Figure 16. Master terminal blocks can be either fixed or drawout mounted. In the drawout design the terminal blocks are rack mounted to permit withdrawal of the entire assembly for ease of wiring during installation and maintenance. Bring field wiring from the horizontal wireway to the master terminal blocks except for load wiring larger than Size 3. These latter load wires should be carried into the vertical wireway and under the bottom right-hand side of the unit to terminations within the unit.

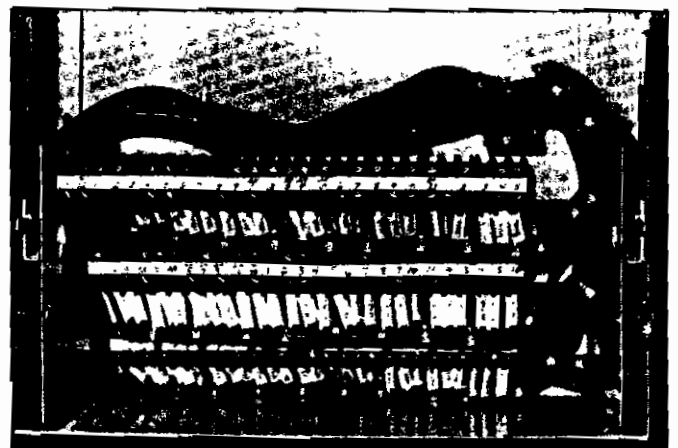


Fig. 16 Master Terminal Blocks

Part 6

OVERCURRENT PROTECTION DEVICES

DEVICE SELECTION

Articles 240 and 430 of the NEC contain the rules for selecting fuses, circuit breakers and overload relays by type and by voltage and ampere rating. Follow these rules for feeder circuits, and the instructions attached to the inside of the left-most vertical wireway door, for motor branch circuits. Select and install overload relay current elements (heaters) based on the motor service factor and full-load current. Ambient compensated overload relays are used in motor control centers (MCC's) to offset the temperature gradient which occurs from top to bottom in a loaded vertical section.

HEATERS MUST BE INSTALLED IN THE STARTER OVERLOAD RELAY ASSEMBLIES BEFORE THE STARTER IS ENERGIZED.

C306 THERMAL OVERLOAD RELAYS (Fig. 24)

C306 Overload Relays are provided on Freedom Starters. Four sizes are available for overload protection up to 114 amperes. Features include:

- Selectable Manual or Automatic Reset operation.
- Interchangeable Heater Packs adjustable $\pm 24\%$ to match motor FLA and calibrated for use with 1.0 and 1.15 service factor motors.
- Heater packs for 32 ampere overload relay will mount in 75 ampere overload relay—useful in derating applications such as jogging.
- Class 10 or 20 heater packs. (Fig. 24) Use Class 10 heaters with fusible or thermal magnetic breaker disconnects only.
- Bimetallic, ambient compensated operated. Trip free mechanism.
- Electrically isolated NO—NC contacts (pull RESET button to test).
- Overload trip indication.
- Single phase protection.
- UL listed, CSA certified and NEMA compliance.

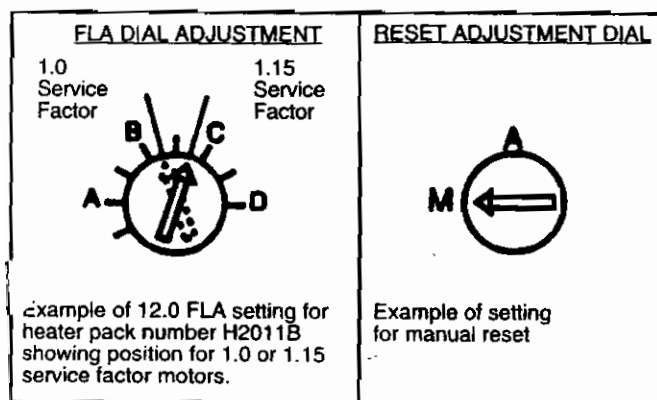


Fig. 23 Overload Relay Settings

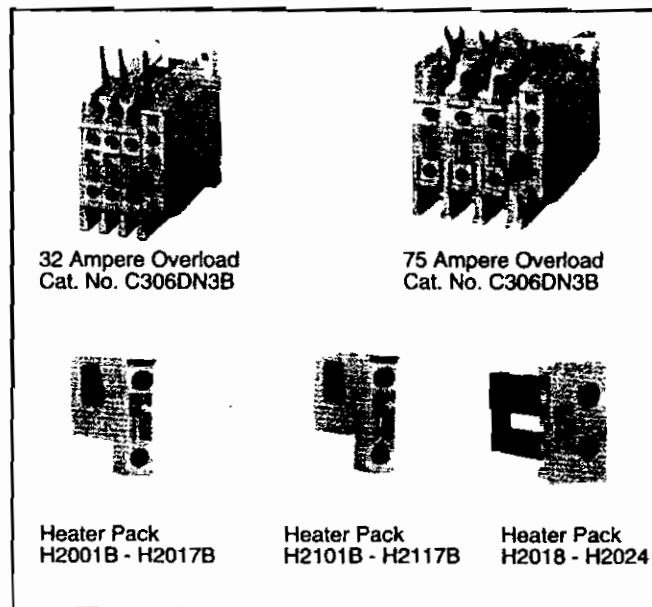


Fig. 24 C306 Thermal Overload Relay and Heater Pack.

C306 OVERLOAD RELAY SETTING

FLA DIAL ADJUSTMENT— For motors having a 1.15 service factor, rotate the FLA adjustment dial to correspond to the motor's FLA rating. Estimate the dial position when the motor FLA falls between two letter values as shown in Fig. 23.

For motors having a 1.0 service factor, rotate the FLA dial one-half position counterclockwise (CCW).

MANUAL / AUTOMATIC RESET — The overload relay is factory set "M" for manual reset operation as shown in Fig. 23. For automatic reset operation, turn the reset adjustment dial to the "A" position.

Automatic reset is not intended to two-wire devices.

TEST FOR TRIP INDICATION — To test overload relay for trip indication when in manual reset, pull out the blue reset button. An orange flag will appear indicating that the device has tripped. Push reset button in to reset.

TEST FOR TRIP INDICATION — To test overload relay for trip indication when in manual reset, pull out the blue reset button. An orange flag will appear indicating that the device has tripped. Push reset button in to reset.

WARNING —To provide continued protection against fire or shock hazard, the complete overload relay must be replaced if burnout of the heater element occurs.

circuit breaker or the load side of the fuses associated with the circuit interrupter has already been connected to the MCC bus bar distribution system. In the case of main disconnects rated 400 amperes or less, this load connection is made by stab connections to vertical bus bars which connect to the horizontal bus distribution system. See Figure 17.

INCOMING LINE LUGS

Where the overcurrent protection for the MCC is at a remote location, the MCC feeder lines are connected to incoming line lugs attached to the bus bar distribution system. See Figure 20. For high-ampere rated horizontal bus bar systems, the incoming line lugs are mounted on vertical risers which connect to the horizontal bus bars. See Figure 21.

SHORT-CIRCUIT BRACING

All incoming lines to either incoming line lugs or to main disconnects must be braced to withstand the mechanical forces created by a high fault current. With the remainder of a Freedom 2100 MCC braced for not less than 65,000 amperes (rms symmetrical), the installing electrician needs to anchor the cables at the incoming line connections sufficiently and tighten the lugs correctly. Each incoming line compartment is equipped with a two-piece spreader bar located about nine inches from the conduit entry. Use this spreader bar and appropriate lacing material to tie cables together where they can be bundled and to hold them apart where they are separated. In other words, position the incoming line cables and then anchor them in place. See Figure 22 and the instruction sheet inside of the MCC.

MAKING CONNECTION

CAUTION: All incoming line compartments present an obvious hazard when the door is opened or

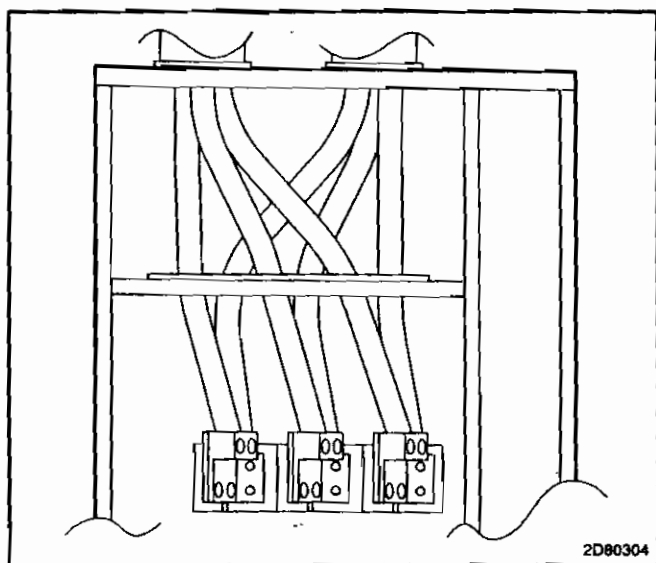


Fig. 20 Incoming Line Lug Connections

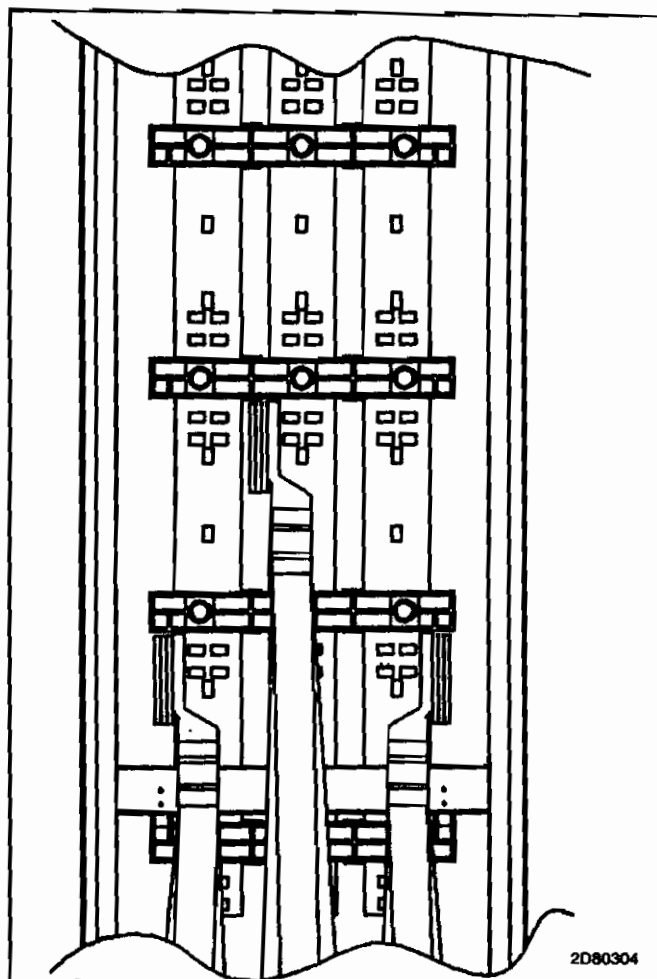


Fig. 21 Incoming Line Compartment, 2000A

covers are removed with power on. When working in this area, the incoming feeder should be de-energized.

Before beginning work on incoming line connections, refer to all drawings furnished by Cutler Hammer as well as all applicable contract drawings for the particular installation.

Depending on the location, size and type of the incoming arrangement, remove one or more horizontal and vertical wireway doors, and selected units to provide complete access. See Part 9 for unit removal instructions.

For top entry, the top cover plates are easily removed for drilling or punching operations.

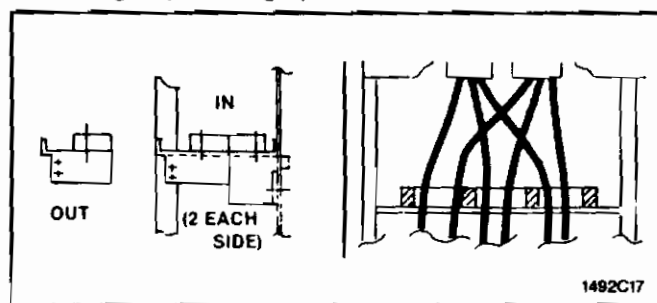


Fig. 22 Spreader Bar For Top Entry

PART 7

OVERLOAD RELAY HEATER SELECTION

HEATER SELECTION AND INSTALLATION

Heaters should be selected on the basis of the actual full load current and service factor as shown on the motor nameplate or in the motor manufacturer's published literature.

When motor and overload relay are in the same ambient and the service factor of the motor is 1.15 to 1.25, select heaters and set FLA adjustment dial from the heater application table. **If the service factor of the motor is 1.0, or there is no service factor shown, rotate the FLA adjustment dial counter-clockwise one half (1/2) position.**

The conductors attached to the terminals of an overload relay act as a heat sink and are a consideration in establishing the current rating of each heater element. To prevent nuisance tripping, which will occur if undersized conductors are used, select the wire size as if the conductors had an insulation temperature rating of 75°C, even if the conductors actually used have a temperature rating higher than 75°C.

Protect heater and starter against short circuits by providing branch circuit protection in accordance with National Electric Code.

Note: Before installing heater packs, refer to the motor nameplate for FLA (full load amps) and service factor (1.5 or 1.0). Select the heater pack from the proper table below.

To install:

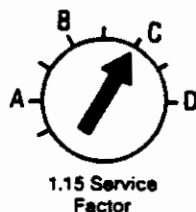
- A. Insert three (3) identically numbered heater packs into the overload relay with an FLA rating that includes the motor nameplate FLA (full load amps).



- B. Tighten the heater pack mounting screws securely per recommended torque values listed below.

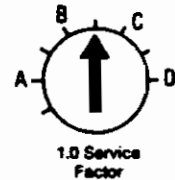
Heater Pack Numbers	Recommended Torque
H2001B thru H2017B	9 lb-in [1 N • m]
H2018 thru H2024	24-30 lb-in [2.7-3.4 N • m]

- C. Adjust the FLA adjustment dial to the motor nameplate FLA (full load amps).

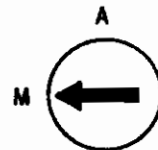


THE OVERLOAD IS NOW SET FOR 1.15 SERVICE FACTOR.

- D. If the motor nameplate is 1.0 service factor, rotate the FLA adjustment dial counter-clockwise one half (1/2) position.



- E. The overload is factory set for **M (MANUAL)** reset operation. If automatic reset is required, turn the reset adjustment dial to **A (AUTO)**. Automatic reset is not intended for two-wire control devices.



TO REMOVE HEATER PACKS

Loosen two (2) heater packs mounting screws and remove heater pack from overload relay.

OVERLOAD RELAY SETTING - This bimetallic ambient compensated overload relay is adjustable within the FLA range of the heater pack. Each heater pack is marked with its FLA ratings. With proper heater section, the overload relay will ultimately trip at 125% FLA for a 1.15 service factor motor and at 115% FLA for a 1.0 service factor motor.

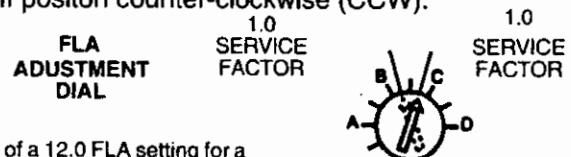
HEATER SELECTION / INSTALLATION - Select the appropriate heater pack number which corresponds to the motor FLA rating for your application. Insert each heater into the overload relay and tighten heater mounting screws securely per table below.

NOTE: A total of three individual heaters **must** be installed in order for the overload relay to work properly.

HEATER PACK NOS.	TORQUE
H2001B thru H2017B	9 lb-in
H2018 thru H2024	24-30 lb-in

FLA DIAL ADJUSTMENT - For motors having a 1.15 service factor, rotate the FLA adjustment dial to correspond to the motor's FLA rating. Estimate the dial position when the motor FLA falls between two letter values as shown in the example.

For motors having 1.0 service factor, rotate the FLA dial one-half position counter-clockwise (CCW).



Example of a 12.0 FLA setting for a heater pack number H2011B showing position for 1.0 or 1.15 service factor motor.

CURRENT TRANSFORMERS

When current transformers are used with overload relays, the current through the overload relay heater is related to the motor full-load by the inverse of the current transformer ratio.

WARNING: Do not ever remove heaters from Size 5 and larger starters to check unit operation. These starters use current transformers to drop the current to the range of the size 1 overload relay. Operation with heaters removed will not interrupt voltage to the motor and will generate dangerous voltages in the open secondary of the current transformer.

MOTOR CIRCUIT PROTECTOR (HMCP)

AFTER INSTALLATION OF THE CONTROL CENTER, EACH MCP MUST BE ADJUSTED TO ACTUAL MOTOR FULL-LOAD AMPERES (FLA) SO THAT IT WILL TRIP AT ANY CURRENT WHICH EXCEEDS STARTING INRUSH. This setting provides low-level fault protection. The first half-cycle inrush will vary with the motor characteristics. Motors with locked-rotor currents of six times motor full-load amperes will usually require an instantaneous magnetic setting of 7 to 11



Fig. 25 HMCP Magnetic Adjustment

times motor full-load amperes to prevent tripping when starting.

A cam to accept a small narrow-blade electrician's screwdriver is near the lower left corner and around which are eight lettered adjustment points, calibrated in trip amperes. See Figure 25. Adjustment should never exceed 13 times FLA which is in accordance with NEC requirements for magnetic-trip-only breakers. **Adjustment should be made as follows:**

1. Obtain FLA from motor nameplate.
2. Multiply FLA by 13.
3. Set the cam to the highest trip setting which does not exceed the calculated figure of Item 2. This is the maximum setting that should be used.
4. Depress and turn the screwdriver adjustment counter-clockwise one setting at a time, until the breaker trips in starting and then adjust upward one setting position. This will insure that the circuit will open instantly on any current above the motor inrush, usually 7 to 11 time FLA.

The PUSH-TO-TRIP button checks the tripping function and is used to periodically exercise the operating mechanism. The button is designed to be operated by using a small screwdriver.

Freedom 2100 MCC's are supplied with Type HMCP motor circuit protectors having an interrupting rating to match the short-circuit withstand rating of the bus bar system. For HMCP's in 225, 400 and 600 ampere frame sizes, the magnetic-trip adjustment is set for each pole. A three-pole HMCP has three trip settings to adjust. Place all three poles at the same setting.

CURRENT LIMITERS FOR USE WITH TYPE HMCP AND FD BREAKERS

The addition of the current limiter provides interrupting capacity above the range handled by the HMCP in motor starters or by FD thermal-magnetic feeder breakers.

Each HMCP or FD breaker rated up to 150 amps has its own current limiter to provide co-ordinated protection against faults up to 100,000 amperes, rms symmetrical.

Built-in trip indicators in each phase immediately show when a fault has blown the current limiter and tripped the circuit breaker. This provides protection against single phasing. **After interrupting a fault, the current limiter will require replacement.** After the fault has been cleared, the current limiter is replaced by the removal of three screws. The breaker can then be reset to provide for subsequent high overcurrent protection.

TYPE HMCP AND FD CIRCUIT BREAKERS WITH TERMINAL END COVERS

Circuit breakers installed in units connected to 600 volt distribution systems require a terminal end cap to be installed on the line side. Replace the terminal end cap when replacing circuit breakers in such units.

Part 8

INSPECTION PRIOR TO ENERGIZING

1. Before energizing the motor control center (MCC), conduct a thorough inspection to make certain that all foreign materials such as tools, scraps of wire and other debris are removed from all units and the structure. Remove any accumulation of dust and dirt with a vacuum cleaner.
2. All circuit connections are tightened at time of assembly by power-driven tools with controlled torque. However, the vibrations experienced in transit may loosen some of these connections. Check at least 10% of the total connections for a tight connection. **Should this spot-check reveal some loose connections, it will be necessary to check all connection points.** The connections to be checked include bus hardware, circuit breaker and switch terminals, contactor and relay terminals and terminal blocks. Always check the incoming line connections. Tighten to the torque values shown in Tables 8-1 and 10-4 (page 27).
3. Remove all blocks or other temporary holding means used for shipment from all component devices in the MCC interior.
4. Check the enclosure to see that it has not been damaged so as to reduce electrical spacings.
5. Compare all circuits for agreement with the wiring diagrams which accompany the MCC. Be sure that each motor is connected to its intended starter.
6. Make certain that field wiring is clear of live busses and physically secured to withstand the effects of fault current.
7. Check to determine that all grounding connections are made properly.
8. Check all devices for damage. Make all necessary repairs or replacements, prior to energizing.
9. Manually exercise all switches, circuit breakers, and other operating mechanisms to make certain that they are properly aligned and operate freely.
10. Test any ground-fault protection systems that were furnished.
11. Set any adjustable current and voltage trip mechanisms to the proper values.
12. Ensure that overload relay heater elements are installed and selected to the full-load current shown on the nameplate of each motor.
13. Install power circuit fuses in the fusible switches in accordance with NEC application requirements. Make sure that fuses are completely inserted in the clips provided. Do not attempt to defeat the rejection feature on the fuse clip, when provided.
14. Do not operate a current transformer with its secondary circuit open. Insure current transformer is connected to a load, or a secondary shorting bar is installed.
15. To prevent possible damage to equipment or injury to personnel, check to insure that all parts and barriers that may have been removed during wiring and installation have been properly reinstalled.

TABLE 8-1 DRIVING TORQUE

TABLE 8-1 DRIVING TORQUE			
Control Wiring:			
Coil Leads			8 lb.-in.
Relays			8 lb.-in.
Push Buttons			8 lb.-in.
Control Fuse Blocks			8 lb.-in.
Auxiliary Contacts			8 lb.-in.
Terminal Blocks			12 lb.-in.
Power Wiring:			
Starters:			
Using Overload Catalog Number	Tighening Torque Load Side		Conductors
C306DN3	20 lb-in		
C306GN3 and size 2 Contactor)	Wire Size(AWG)	Torque (lb-in)	Use 75° C copper conductors
	14-10	35	
	8	40	
	6 - 4	45	
	3 - 2	50	
For Starters	Slotted Head Screw		
Size 3	Wire size(AWG)	Torque (Lb-in)	Use 75°C copper or aluminum conductors
	8	40	
	6 - 4	45	
	3 - 2	50	
	Socket Head Screw		
	Socket Size (In)	Torque (Lb-in)	
	3/16	120	
	1/4	200	
	5/16	250	
	Size N and Size 4	275 lb-in	
Size 5 and Size 6	500 lb-in		
Fused Switches:			
30 Amp Fuse Assy			25 lb.- in.
60 Amp Fuse Assy			50 lb.- in.
100 Amp Fuse Assy			50 lb.- in.
200 Amp Fuse Assy			300 lb.- in.
400 Amp Fuse Assy			300 lb.- in.
600 Amp Fuse Assy			300 lb.- in.
BREAKERS- Refer to Torque Values on Breaker Case			
Incoming Line Lugs:			
#2/0- 350 MCM			360 lb.- in.
#2/0- 650 MCM			360 lb.- in.
#2/0- 750 MCM			500 lb.- in.
500-1000 MCM			600 lb.- in.
Bus Bolts:			
All			275 lb.- in.(23lb.-ft.)

16. Conduct an electrical insulation resistance test to make sure that the MCC and field wiring are free from short circuits and grounds. Do this test phase-to-phase, phase-to-ground, and phase-to-neutral, with the switches or circuit breakers opened.
17. If the MCC contains a labyrinth vertical bus barrier system, verify the operation of the automatic shutters. See Part 9 for adjustments of this mechanism.
18. Install covers, close doors, and make certain that no wires are pinched and that all enclosure parts are properly aligned and tightened.
19. Turn all circuit breakers and fusible switches to the OFF position before energizing the bus.

I.B. 8926-1A

MANUAL/AUTOMATIC RESET - The overload relay is factory set at "M" for manual reset operation as shown in the illustration. For automatic reset operation, turn the reset adjustment dial to the "A" position.

Automatic reset is not intended for two-wire control devices.



Example of setting for manual reset.

TEST FOR TRIP INDICATION - To test overload relay for trip indication when in manual reset, pull out the blue reset button. An orange flag will appear indicating that the device has tripped. Push reset button into reset.

NEMA SIZE 0 AND 1				SIZE F
HEATER PACK SELECTION TABLE				STD TRIP CLASS 20
MOTOR FLA RATING ♦				
FLA DIAL POSITIONS				
A	B	C	D	
.254	.306	.359	.411	H2001B
.375	.452	.530	.607	H2002B
.560	.676	.791	.907	H2003B
.814	.983	1.15	1.32	H2004B
1.20	1.45	1.71	1.96	H2005B
1.79	2.16	2.53	2.90	H2006B
2.15	2.60	3.04	3.49	H2007B
3.23	3.90	4.56	5.23	H2008B
4.55	5.50	6.45	7.40	H2009B
6.75	8.17	9.58	11.0	H2010B
9.14	10.8	12.4	14.0	H2011B
14.0	16.9	19.9	22.8	H2012B
18.7	22.7	26.7	30.7	H2013B ■
23.5	28.5	33.5	—	H2014B ■

MAXIMUM RATINGS			
NEMA SIZE	AMPERES	SIZE	AMPERES
0	18		
1	27	F	32

Use 75°C copper conductors only
Max. Wire Size - 8 AWG

■ **NOTE:** After the above referenced settings have been made, rotate the FLA dial **one position clockwise** for these heaters (see table). If less than one position is available, rotate dial maximum. This note **does not** apply when these heaters are used with adapter base. Catalog No. C306TB1. **Exception:** does not apply to AN16DN0.

WARNING - To provide continued protection against fire or shock hazard, the complete overload relay must be replaced if burnout of the heater element occurs.

NEMA SIZE 2				SIZE J and K
HEATER PACK SELECTION TABLE				STD TRIP Class 20
MOTOR FLA RATING ♦				
FLA DIAL POSITIONS				
A	B	C	D	
3.23	3.90	4.56	5.23	H2008B
4.55	5.50	6.45	7.40	H2009B
6.75	8.17	9.58	11.0	H2010B
9.14	10.8	12.4	14.0	H2011B
14.0	16.9	19.9	22.8	H2012B
18.7	22.7	26.7	30.7	H2013B
23.5	28.5	33.5	38.5	H2014B
29.0	34.0	39.1	44.1	H2015B
39.6	45.5	51.5	57.4	H2016B ●
53.9	60.9	67.9	74.9	H2017B ●

MAXIMUM RATINGS

NEMA SIZE	AMPERES	SIZE	AMPERES
2	45	J	60
		K	73

Use 75°C copper conductors only
Max. Wire Size - 3 AWG

● **NOTE:** After the above reference settings have been made, rotate the FLA dial **one position clockwise** for these heaters (see table). If less than one position is available, rotate dial to maximum. This note **does not** apply when these heaters are used with adapter base. Catalog No. C306TB1.

NEMA SIZE 3 AND 4				SIZE N
HEATER PACK SELECTION TABLE				STD TRIP CLASS
MOTOR FLA RATING ♦				
FLA DIAL POSITIONS				
A	B	C	D	20
18.0	20.2	22.3	24.5	H2018
24.6	27.6	30.5	33.4	H2019
33.5	37.5	41.5	45.6	H2020
45.7	51.2	56.7	62.1	H2021
62.2	69.7	77.1	84.6	H2022
84.7	94.9	105	115	H2023
106	118	131	144	H2024

MAXIMUM RATINGS

NEMA SIZE	AMPERES	SIZE	AMPERES
3	90	N*	14
4*	135		

*Minimum Wire Size - 6 AWG

● **NOTES:**
Part Winding Starters - Select heater packs for 50% of the motor FLA
Wye Delta Starters - Select heater packs for 58% motor FLA

♦ For motor FLA values not listed, turn the dial clockwise for higher or counterclockwise for lower ratings.

NEMA SIZE 5				STD TRIP CLASS 20
HEATER PACK SELECTION TABLE				
MOTOR FLA RATING ▲				
FLA DIAL POSITIONS				
A	B	C	D	
34	41	48	54	H2003B
49	59	69	79	H2004B
72	87	103	118	H2005B
107	130	152	174	H2006B
129	156	182	209	H2007B
194	234	274	—	H2008B

MAXIMUM RATINGS

NEMA Size 5 = 270 Amperes Min. Wire Size - 2 AWG

NEMA SIZE 6				STD TRIP CLASS 20
HEATER PACK SELECTION TABLE				
MOTOR FLA RATING				
FLA DIAL POSITIONS ▲				
A	B	C	D	
144	174	205	235	H2005B
215	259	304	348	H2006B
258	312	365	419	H2007B
388	468	547	—	H2008B

MAXIMUM RATINGS

NEMA Size 6 = 540 Amperes

▲ FLA rating marked on heater pack multiplied by a transformation ratio. For motor FLA values not listed, turn the dial clockwise for higher or counterclockwise for lower ratings.

Magnetic Reduced Voltage Starter Classes F600, F700, F890 with C306 Thermal Overload Relay.

Starter Type	Class	Multiply actual motor full load current by factor below and refer to adjusted full load current column in tables.	Qty. of heaters required per starter
Autotransformer	F600	1	3
Part-Winding	F700	.5	6
Star-Delta	F890	.575	3

DETENT POSITION

For maintenance and test purposes, the unit can be partially withdrawn (approximately 1 1/2 inches) until the stabs are free of the bus. In this position, the quarter-turn latch can be rotated clockwise to engage the detent position slot; this will secure the unit to ensure the stabs remain disengaged during maintenance. See Figure 29. The latch can be padlocked in this position.

OPERATING HANDLE LINKAGE ADJUSTMENT

Movement of the operating handle in the vertical plane should not be restricted by the handle cavity at either the top or bottom to its travel. Should restriction occur, eliminate it adjusting the length of the operating linkage as shown in Figure 30. Depending on the type of primary disconnect device contained in the control unit, it may be necessary to lengthen or shorten the linkage.

AUTOMATIC SHUTTER TRAVEL ADJUSTMENT

When the optional labyrinth vertical bus barrier is installed in the control center, a shutter is provided to automatically cover the stab openings when a control unit is withdrawn. The shutter is opened by engagement of the left-hand side of the control unit with the shutter arm linkage attached to the left-hand vertical structural members. When the unit is withdrawn free of the linkage, a spring automatically moves the shutter to its closed position. See Figure 31 and Figure 4.

With the control unit removed, the shutter should completely cover the stab openings. If it does not cover the openings, use an adjustable wrench to bend the link arm to the right until the shutter covers the stab openings.

If, on re-insertion of the control unit, interference is felt between the stab assembly at the rear of the unit and the shutter, the engagement of the control unit with the shutter arm linkage is insufficient to fully open the shutter. Use an adjustable wrench to bend the linkage arm inward toward the unit to increase its engagement with the unit. An inward bend of approximately 1/4 inch will provide sufficient additional shutter travel.

INSTALLING PILOT DEVICES

The device panel can accommodate up to six pilot devices such as oil-tight pushbuttons, indicating lights, selector switches and miniature meters. If unused space is available and the addition of other devices is desired, observe the following procedure.

After opening the unit door, loosen the two screws at the top of the device panel. Slide the panel 1/2 inch left to permit it to swing down for access. See Figure 32. With the peen end of a ball-peen hammer or with a drift or chisel, remove the desired knockout.



Fig. 29 Unit Locked in Detent Position



Fig. 30 Operating Handle Linkage Adjustment



Fig. 31 Shutter Arm Linkage

Part 9

UNIT INSTALLATION AND ADJUSTMENT

DOOR REMOVAL AND INSTALLATION

All doors on the control center are mounted on pin hinges to facilitate removal for installation and maintenance operations. With the operating handle in the OFF position, rotate the quarter-turn latches, open the door, remove the hinge pins as shown in Figure 26, partially close the door and lift it from the structure. Reverse this procedure for installation.

UNIT REMOVAL AND INSTALLATION

After opening and/or removing the unit door, the control unit is exposed. With a screwdriver, push in on the latch at the top center of the unit and rotate $\frac{1}{4}$ turn counterclockwise. **CAUTION** — Units 18" or more high have a retaining brace at the lower edge of each side of the unit frame to add stability in shipping. The shipping braces may be retained or removed after installation; unscrew prior to unit withdrawal. Pull-apart terminal blocks in the vertical wireway must be disengaged (see Figure 27 and page 10) and wiring from the unit to other units, to master terminal blocks or to load devices must be disconnected before the unit is removed. Grasp the unit as shown in Figure 28 and pull it outward. The first inch of travel pulls the stabs free from the vertical bus, and the grounding clip on the side of the unit frame is also disengaged.

To replace a control unit, position the mounting points on the unit frame with the mating guide rails. Slide the

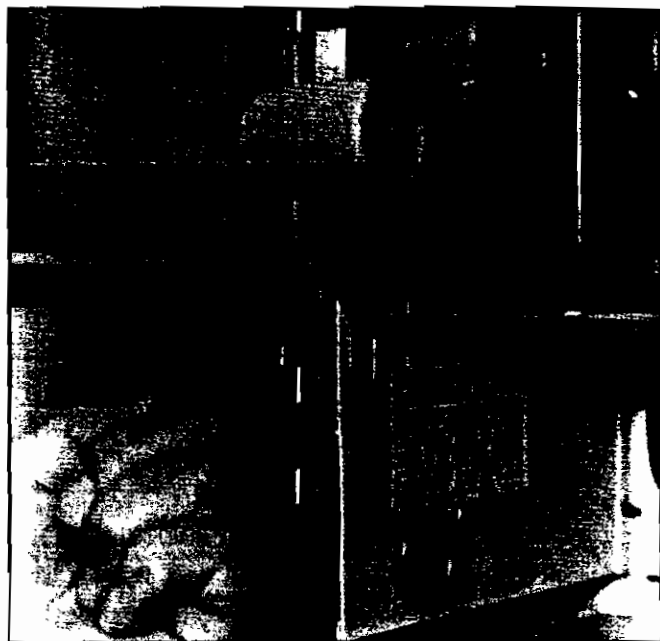


Fig. 26 Hinge Pin Removal

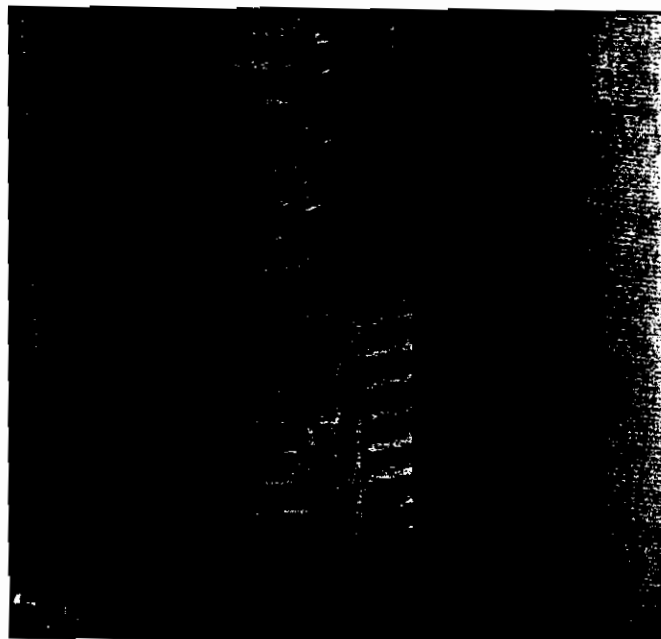


Fig. 27 Disengaging Pull-Apart Terminal Blocks

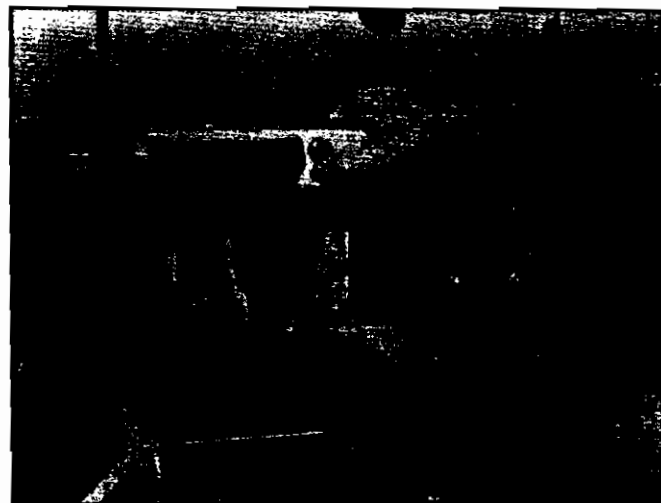


Fig. 28 Withdrawing a Unit

unit inward until all four mounting points are engaged, then move it inward with a quick push. This movement easily overcomes the compression of the stabs as they engage the vertical bus. With the unit in its correct position, the quarter-turn latch is easily engaged by pushing inward and rotating $\frac{1}{4}$ turn clockwise.

Part 10 MAINTENANCE

PREVENTIVE MAINTENANCE

Preventive maintenance should be a program, a scheduled periodic action that begins with the installation of the equipment. At that time, specific manufacturer's instruction literature should be consulted, then stored for future reference. Follow-up maintenance should be at regular intervals, as frequently as the severity of duty justifies. Time intervals of one week, or one month, or one year may be appropriate, depending on the duty. It is also desirable to establish specific check lists for each control, as well as a logbook to record the history of incidents. A supply of renewal parts should be obtained and stored.

This control equipment is designed to be installed, operated, and maintained by adequately trained workmen. These instructions do not cover all details, variations, or combinations of the equipment, its storage, delivery, installation, check-out, safe operation, or maintenance. Care must be exercised to comply with local, state, and national regulations, as well as safety practices, for this class of equipment.

Authorized personnel may open a unit door of a motor control center (MCC) while the starter unit is energized. This is accomplished by defeating the mechanical interlock between the operating mechanism and the unit door. A clockwise quarter-turn of the slotted head screw located above operating handle will allow the door to open. See Figure 33.

When servicing and adjusting the electrical equipment, refer to the applicable drawings covering the specific motor control center (MCC) and any other related interconnection drawings. Follow any instructions which may be given for each device. A list of instruction leaflets covering standard components is shown on the back page of this manual. Any of these leaflets may be obtained by contacting your nearest Cutler-Hammer Representative.

General guidelines. The whole purpose of maintaining electrical equipment can be summarized in two rules:

- a. Keep those portions conducting that are intended to be conducting.
- b. Keep those portions insulated that are intended to be insulated.

Good conduction requires clean, tight joints, free of contaminants such as dirt and oxides.

Good insulation requires the absence of carbon tracking and the absence of contaminants such as salt and dust that become hygroscopic and provide an unintended circuit between points of opposite polarity.



Fig. 33 Defeater Mechanism

CAUTION: Maintenance of control components requires that all power to these components be turned OFF by opening the branch circuit disconnect means and withdrawing the unit to the detent position (see Figure 29) or removing the unit entirely from the MCC. When units are fully inserted into the MCC, the line side of each disconnect is energized. Do not work on fixed units unless the main disconnect for the MCC is OFF.

When working on portions of a branch circuit remote from the MCC, lock the disconnect means for that circuit in the OFF position. To positively lock the operating mechanism in the OFF position, a metal locking bar



Fig. 34 Locking Out a Disconnect

CAUTION: Brace the panel solidly to avoid breaking the hinge points. Use a knife or small file to remove remaining plastic burrs. Install and wire the new device and re-attach the top of the device panel to the unit.

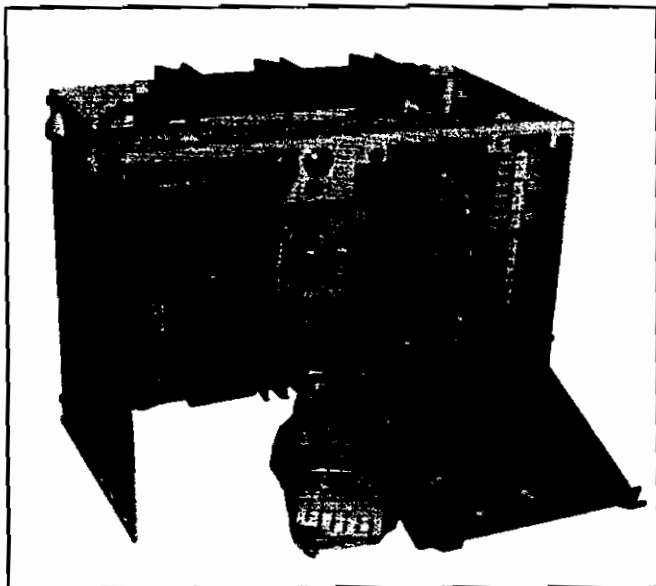


Fig. 32 Unit Device Panel

INSTALLING A NEW UNIT

It is recommended that a new unit be installed in a unit space at the top of a vertical compartment or directly below an existing unit. Material provided with the new unit by the factory includes: a divider pan with integral guide rails, a unit door, hinges, catches and hardware. Observe the following sequence of operations for installation.

1. Remove the existing blank door.
2. Position the new unit door over the open space to ensure the hinges and latches are aligned. If the spaces differ, the hinges and latches on the structure must be re-located to match the unit door hinges and latches. Mount the door, using the hinge pins provided.
3. Install the new divider pan in the notches provided in the rear barrier so that it is aligned with the bottom of the new door. Attach the pan to the vertical structure channels with one thread-forming screw on each side.
4. Remove from the vertical bus barrier the flat plate which covers the stab holes that will align with the stabs on the new unit. If an optional labyrinth vertical bus barrier is in place, install an automatic shutter over the stab cutouts. Follow the instruction sheet provided with the shutter kit.

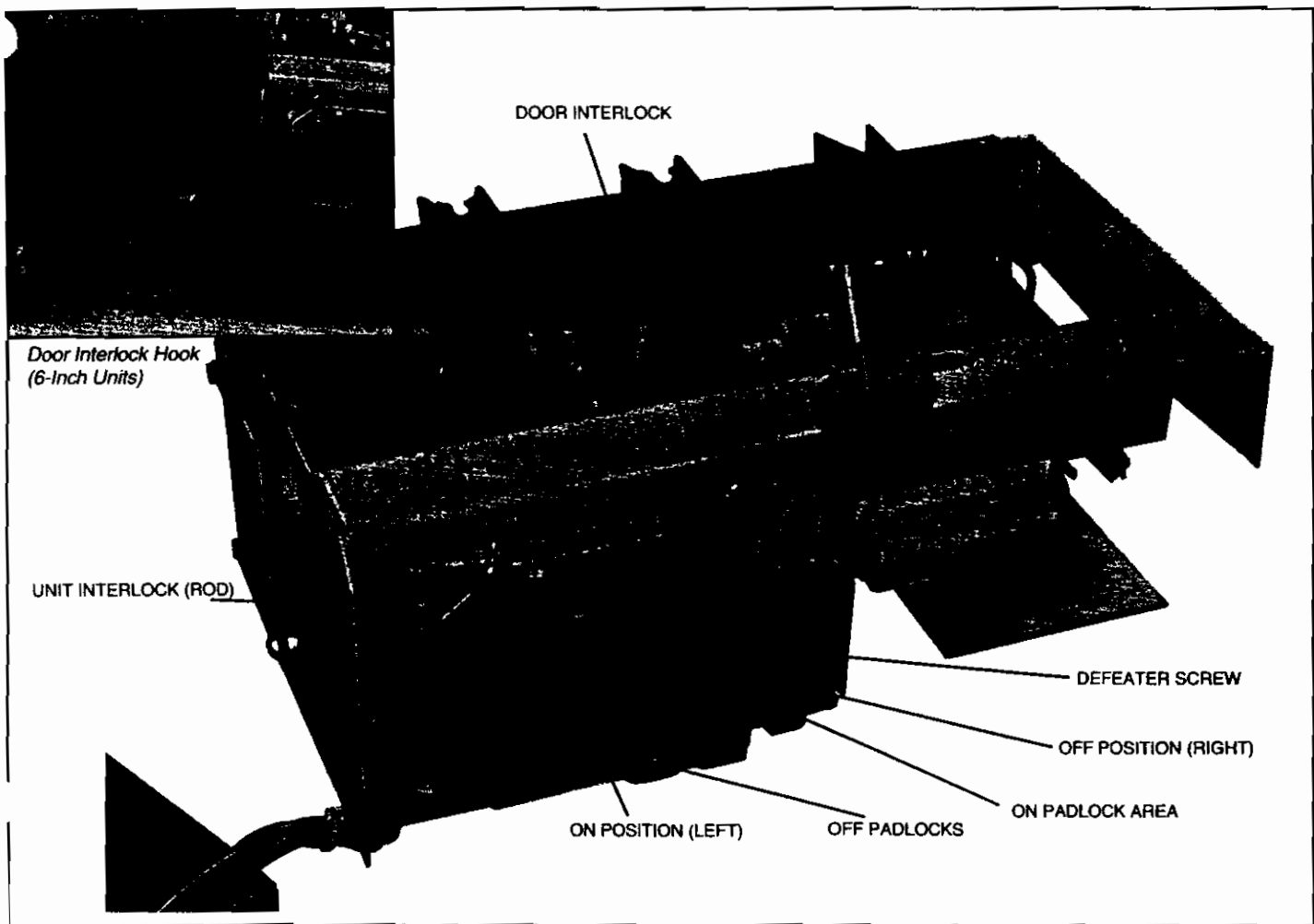


Fig. 35 6-inch Breaker Unit Slider Operator Mechanism

MCC Slider Operator Mechanism Padlocking

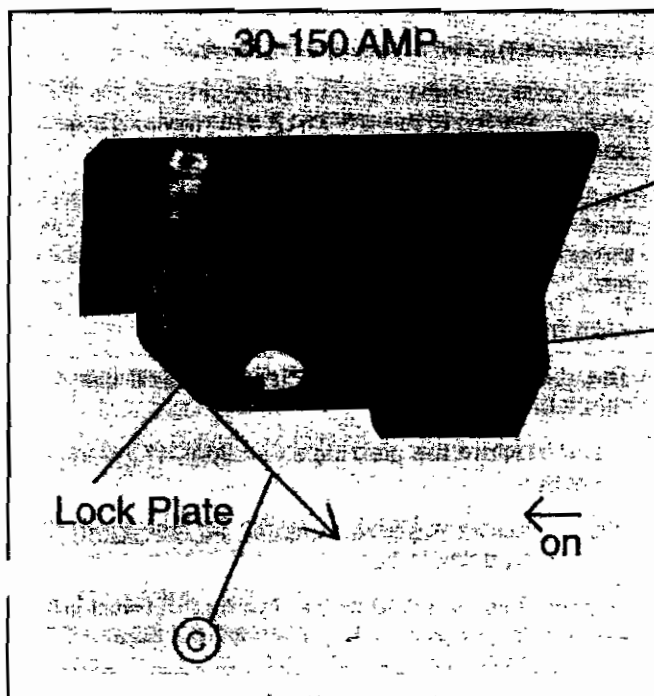


Fig. 36

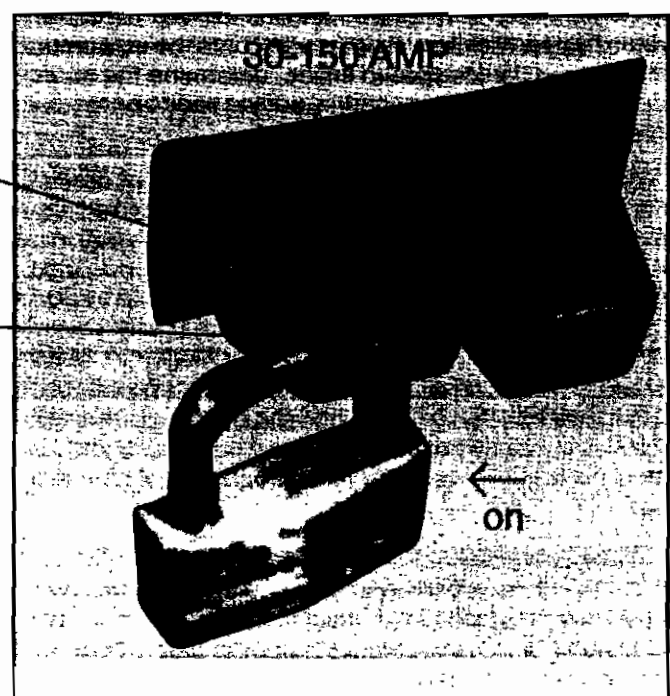


Fig. 37

I.B. 8926-1A

recessed in the handle may be extended and padlocked with from one to three padlocks. See Figure 34.

With the door open and the disconnect device OFF, the operating handle is mechanically interlocked to prevent inadvertently being pushed ON. To defeat this interlock, the bar on the top of the mechanism should be pushed in slightly, allowing the handle to move upward to the ON position. **WARNING: IF FULLY INSERTED, THE POWER AND CONTROL CIRCUITS WILL BE ENERGIZED.** Padlocking to prevent this handle movement may be accomplished by the same method as described above.

Separate control sources of power must also be disconnected. If control power is used during maintenance, take steps to prevent feedback of a hazardous voltage through a control transformer. Be alert to power factor correction capacitors that may be charged. Discharge them before working on any part of the associated power circuit.

Cleaning. Soot, smoke, or stained areas (other than inside arc chutes), or other unusual deposits, should be investigated and the source determined before cleaning is undertaken. Vacuum or wipe clean all exposed surfaces of the control component and the inside of its enclosure. Equipment may be blown clean with compressed air that is dry and free from oil. (Be alert to built-in oilers in factory compressed air lines!) If air blowing techniques are used, remove arc covers from contactors and seal openings to control circuit contacts that are present. It is essential that the foreign debris be removed from the control center, not merely rearranged. Control equipment should be clean and dry. Remove dust and dirt inside and outside the cabinet without using liquid cleaner. Remove foreign material from the outside top and inside bottom of the enclosure, including hardware and debris, so that future examination will reveal any parts that have fallen off or dropped onto the equipment. If there are liquids spread inside, determine the source and correct by sealing conduit, adding space heaters, or other action as applicable.

Mechanical checks. Tighten all electrical connections. Look for signs of overheated joints, charred insulation, discolored terminals, etc. Mechanically clean to a bright finish (don't use emery paper) or replace those terminations that have become discolored. Determine the cause of the loose joint and correct. Be particularly careful with aluminum wire connections. Aluminum wire is best terminated with a crimp type lug that is attached to the control component. When screw type lugs (marked CU/AL) are used with aluminum wire, joint should be checked for tightness every 200 operations of the device.

Wires and cables should be examined to eliminate any chafing against metal edges caused by vibration, that could progress to an insulation failure. Any temporary wiring should be removed, or permanently secured and diagrams marked accordingly.

The intended movement of mechanical parts, such as the armature and contacts of electromechanical contactors, and mechanical interlocks should be checked for freedom of motion and functional operation.

Wrap-up. Check all indicating lamps, mechanical flags, doors, latches, and similar auxiliaries and repair, if required.

Log changes and observations into record book before returning equipment into service. Do not remove any labels or nameplates. Restore any that are damaged.

SLIDER OPERATOR MECHANISM— (6-Inch Units) (See Figure 35)

The following features are found on 6-inch units with circuit breaker operators.

A. Door Interlock

The operator mechanism is factory adjusted and normally does not need field adjustment. The door interlock mechanism engages a hook that is mounted to the welded bracket. This allows the unit door to open when the operator handle is in the "off" (right) position. With the handle in the "on" (left) position, the door is interlocked and should not open. If the door hook and the mechanism do not engage properly, the positioning of the door hook on the bracket may need adjustment. The door hook can be adjusted left or right by loosening the screw (see photograph). After adjustment, tighten screw to 20lb./in. [2.2 N•m]. See Figure 38 insert.

B. Defeater Screw

Turning the defeater screw clockwise allows you to open the unit door (access to the panel mounted components) with the operator handle (padlocked or not) in the "on" (left) position.

C. Padlocking (See Figures 36, 37 & 38)

The operator handle can be padlocked in the "off" position with up to three 3/8" [19.5 mm](Max.) shank padlocks.

To provide for padlocking the circuit breaker operator in the "on" position, drill the appropriate size hole through the drill point located on the operator mechanism.

D. Unit Interlock

The unit interlock is provided to assure that the unit circuit breaker is:

- Open before the stab clips can contact the vertical bus.
- Open before the stab clips can be disengaged from the vertical bus.

The unit interlock and bracket does not need field adjustment. The interlock bracket will be adjusted to almost touch the side of the unit interlock rod when the operator is in the "on" position.

CONTACT EVALUATION

Time of Service	Contact Appearance
New	The new contact has a uniform silver color.
Start of Service	The contact surface will have a blue coloring. The geometric form of the contact is unchanged. The sharp outer corners will be rounded with small silver beads. (See Figure 39.)
Intermediate Service to End of Service Life	The coloring changes to brown or black with distributed small silvery white areas. The surface has a finely chiselled appearance. Material transfer causes small peaks and valleys in the contact button surface. (See Figure 40.)

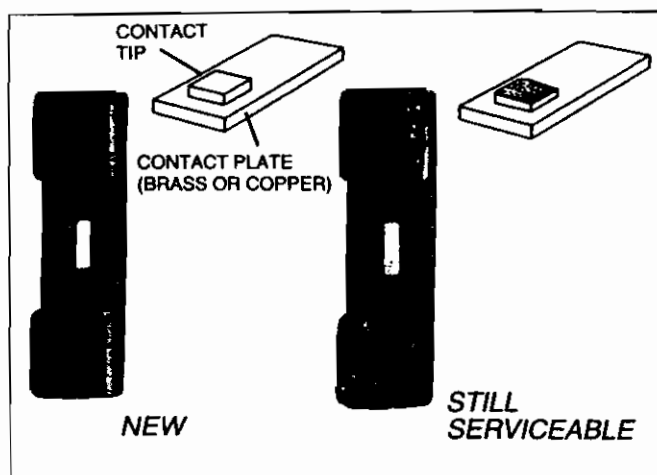


Fig. 39 Normal Service Wear

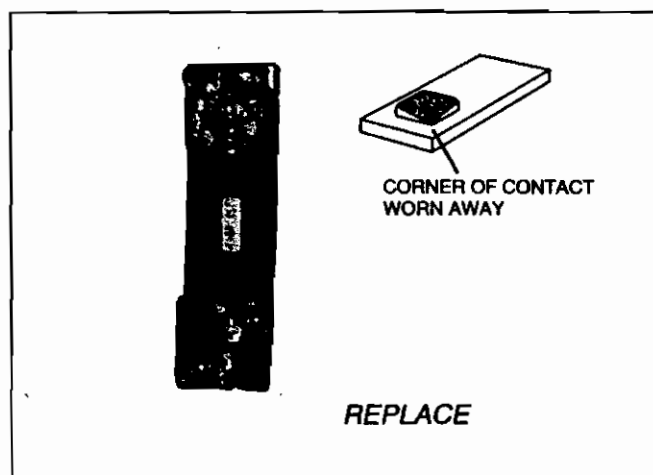


Fig. 40 End of Service Life

ABNORMAL WEAR CONDITIONS

Contact Appearance	Cause
Curling and Separation of Corner of Contact	Curling is usually a result of service that produces very high heat, as under jogging or inching duty.
Irregular Contour or Slantwise Wear	One corner of a contact may wear more quickly than the other three corners. This wear is normally due to misalignment of the moving and stationary contacts. Contacts should be replaced if it is apparent that one contact is nearly making direct contact with the contact carrier.
Large Beads of Silver On Edges of Contacts	Breaking an excessive current.
Welded Spot (Core of Smooth, Shining Silver Surrounded by a Roughened Halo)	Making an excessive current. High frequency of operation, i.e., jogging.

CONTACTOR TROUBLESHOOTING CHART (Cont.)

Defect	Cause	Remedy	Defect	Cause	Remedy
Short Contact Life (cont.)	Load current is too high	Reduce load. Use larger contactor.	Overheating	Load current too high	Reduce load. Use larger contactor.
	Jogging cycle is too severe	Reduce jogging cycle. Use larger contactor.		Loose connections	Clean discolored or dirty connections and retighten. Replace poorly crimped lugs.

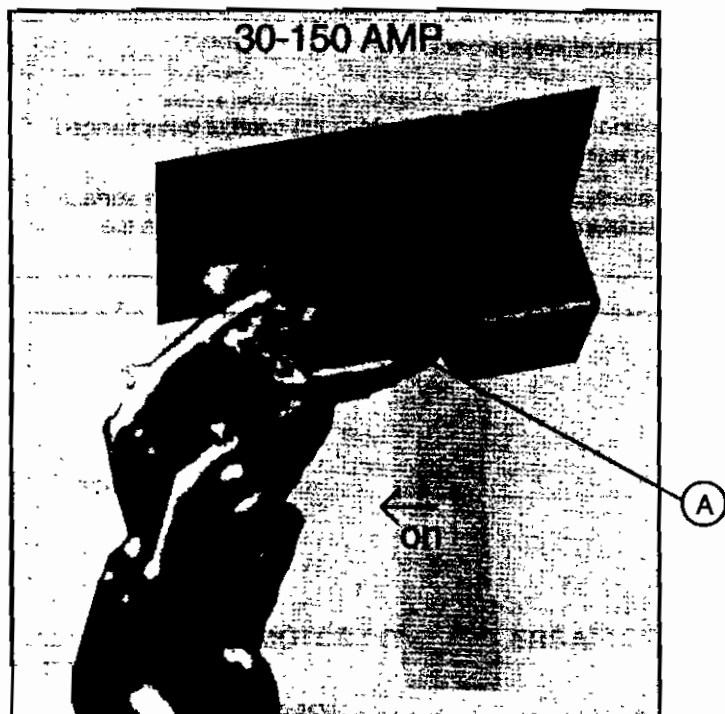


Fig. 38

- Ⓐ Rectangular slot for scissors.
- Ⓑ One 1/4" or 5/16" diameter padlock hasp.
- Ⓒ Rotate lock plate for one to three 3/8" diameter padlock hasp locks.

CONTACT WEAR AND REPLACEMENT

Contractors are subject to both mechanical and electrical wear during their operation. In most cases mechanical wear is insignificant. The erosion of the contacts is due to electrical wear. During arcing, material from each contact is vaporized and blown away from the useful contacting surface.

A critical examination of the appearance of the contact surfaces and a measurement of the remaining contact overtravel will give the user the information required to get the maximum contact life.

OVERTRAVEL MEASUREMENT

Contact life has ended when the overtravel of the contacts has been reduced to .020 inch.

Overtravel of the contact assembly is that part of the stroke which the moving contacts would travel after touching the fixed contacts if they were not blocked from movement by the fixed contacts.

A method of measuring overtravel is as follows:

- A. Place a .020 inch feeler gauge between the armature and magnet, with the armature held tightly against the magnet.
- B. Check continually in each phase, i.e., determine if circuit from terminal-to-terminal for each pole is open under these conditions.

C. If there is continuity through all phases, the remaining overtravel is sufficient. If there is not continuity through all phases, replace all stationary and moving contacts plus moving contact overtravel springs. After replacing parts, manually operate contactor to be sure binding does not occur.

CONTACTOR TROUBLESHOOTING CHART

Defect	Cause	Remedy
Short contact life	Low contact force	Adjust overtravel, replace contacts, and replace contact springs as required to correct contact force.
	Contact bounce on opening or closing	Correct improper voltage applied to coil. Correct any mechanical defects or misalignment.
	Abrasive dust on contacts	Do not use emery cloth to dress contacts.

(cont. on page 26)

RENEWAL PARTS

When ordering renewal control center parts, give the complete nameplate reading. Always give the name of the part wanted, the part, catalog or style number of the individual apparatus on which it is to be used, and the order number of the complete motor control center.

Control center renewal parts identified by part or style number are detailed in Cutler-Hammer Renewal Parts Data. The nomenclature to identify these parts is shown in Figures 2 and 41. The most common renewal parts for components are shown in Table 10-1.

TABLE 10-1 RENEWAL CONTACT KITS, COILS & OVERLOAD RELAYS

Description					
	NEMA SIZE 1	NEMA SIZE 2	NEMA SIZE 3	NEMA SIZE 4	NEMA SIZE 5
	Series B1	Series B1			Series B1
	Part No.	Part No.	Part No.	Part No.	Part No.
Renewal Parts Publ.	22177	22177	20426	20428	20429
CONTACT KITS					
2 Pole	6-65	6-65-7	6-43-5	6-44	6-45
3 Pole	6-65-2	6-65-8	6-43-6	6-44-2	6-45-2
4 Pole	6-65-9	6-65-15	_____	_____	_____
5 Pole	6-65-10	6-65-16	_____	_____	_____
MAGNET COILS	Coil Suffix				
120V 60 Hz or 110V 50 Hz	A	9-2703-1	9-2703-1	9-2756-1	9-1891-1
240V 60 Hz or 220V 50 Hz	B	9-2703-2	9-2703-2	9-2756-2	9-1891-2
480V 60 Hz or 440V 50 Hz	C	9-2703-3	9-2703-3	9-2756-3	9-1891-3
600V 60 Hz or 550V 50 Hz	D	9-2703-4	9-2703-4	9-2756-4	9-1891-4
208V 60 Hz	E	9-2703-9	9-2703-9	9-2756-5	9-1891-13
277V60 Hz	H	9-2703-7	9-2703-7	9-2756-9	9-1891-26
208/240V 60 Hz	J	_____	_____	_____	_____
240V 50 Hz	K	9-2703-14	9-2703-14	9-2756-13	9-1891-20
380-415V 50 Hz	L	9-2703-8	9-2703-8	_____	_____
380V 50 Hz	L	_____	_____	9-2756-12	9-1891-14
415V 50 Hz	M	_____	_____	9-2756-8	9-1891-21
550V 50 Hz	N	_____	_____	9-2756-14	9-1891-8
OVERLOAD RELAYS					
For replacement on existing starters 3 Pole—Ambient Compensated Bimetallic.....		C306GN3B	C306GN3B	C306KN3	C306NN3
				C306NN3	C306DN3B

CONTACTOR TROUBLESHOOTING CHART (Cont.)

Defect	Cause	Remedy
Overheating	Ambient temperature is too high	Reduce load. Provide better ventilation. Relocate starter. Use larger contactor.
	Line and/or load cables are too small	Install terminal block and run larger conductors between contactor and terminal block.
Welding of contacts	Excessive contact bounce on closing	Correct coil overvoltage condition.
	Jogging duty is too severe	Reduce jogging cycle. Use larger contactor.

MAINTENANCE OF MOTOR CONTROLLERS AFTER A FAULT†

In a motor branch circuit which has been properly installed, coordinated and in service prior to the fault, opening of the branch-circuit short-circuit protective device (fuse, circuit breaker, motor short-circuit protector, etc.) indicates a fault condition in excess of operating overload. This fault condition must be corrected and the necessary repairs or replacements made before reenergizing the branch circuit.

It is recommended that the following general procedures be observed by qualified personnel in the inspection and repair of the motor controller involved in the fault.

Procedure. Caution: All inspections and tests are to be made on controllers and equipment which are deenergized, disconnected and isolated so that accidental contact cannot be made with live parts and so that all plant safety procedures will be observed.

Enclosure. Substantial damage to the unit door or frame such as deformation, displacement of parts or burning, requires replacement of the entire unit.

Circuit breaker. Examine the unit interior and the circuit breaker for evidence of possible damage. If evidence of damage is not apparent, the breaker may be reset and turned ON. If it is suspected that the circuit breaker has opened several short-circuit faults or if signs of circuit breaker deterioration appear within the enclosure, the circuit breaker should be replaced.

Disconnect switch. The external operating handle of the disconnect switch must be capable of opening the switch. If the handle fails to open the switch or if visual inspection after opening indicates deterioration beyond

CONTACTOR TROUBLESHOOTING CHART (Cont.)

Defect	Cause	Remedy
Welding of contacts	Excessive inrush current	Motor has locked rotor code letter greater than G. Most contactors are designed for motors with code letters A through G. Therefore, use larger contactor. Check factory for weld-resistant contact material.
	Vibration in starter mounting	Move starter to location having less shock and vibration. Insulate starter from shock and vibration. Provide more rigid support for starters.

normal wear and tear, such as overheating, contact blade or jaw pitting, insulation breakage or charring, the switch must be replaced.

Fuse holders. Deterioration of fuse holders or their insulating mounts requires their replacement.

Terminals and internal conductors. Indications of arcing damage and/or overheating such as discoloration and melting of insulation require the replacement of damaged parts.

Contactors. Contacts showing heat damage, displacement of metal, or loss of adequate wear allowance require replacement of the contacts and the contact springs. If deterioration extends beyond the contacts, such as binding in the guides or evidence of insulation damage, the damaged parts or the entire contactor must be replaced.

Overload relays. If burnout of the current element of an overload relay has occurred, the complete overload relay must be replaced. Any indication that an arc has struck and/or any indication of burning of the insulation of the overload relay also requires replacement of the overload relay.

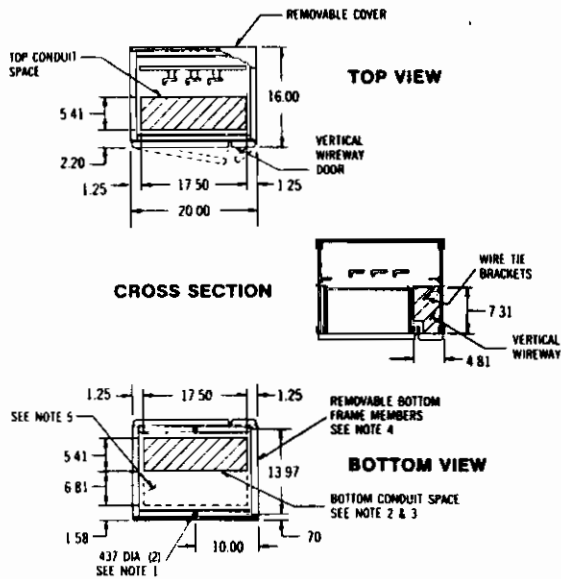
If there is no visual indication of damage that would require replacement of the overload relay, the relay must be electrically or mechanically tripped to verify the proper functioning of the overload relay contact(s).

Return to service. Before returning the controller to service, checks must be made for the tightness of electrical connections and for the absence of short circuits, grounds and leakage.

All equipment enclosures must be closed and secured before the branch circuit is energized.

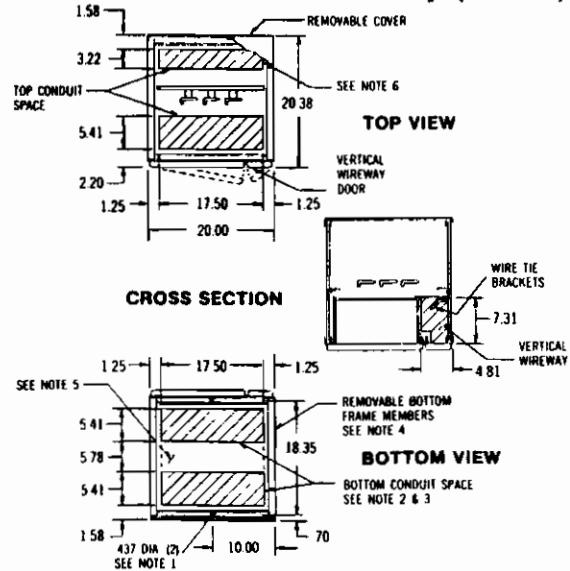
Part 11 PLAN VIEWS

**20 Inches Wide, 16 Inches Deep
Front Mounted Only (4710A30)**



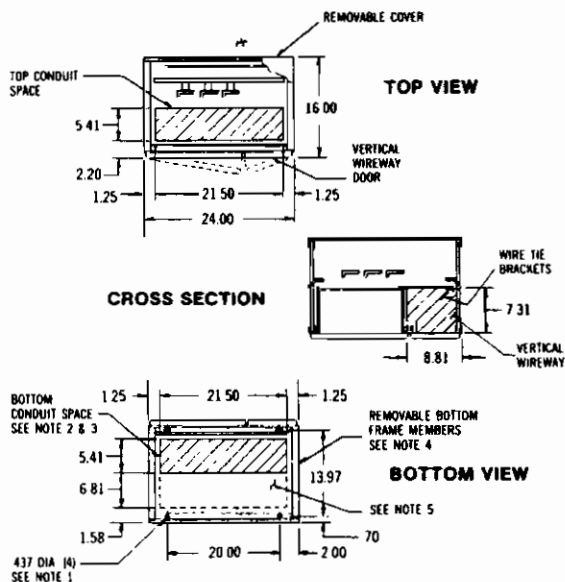
1. Minimum length of anchor bolt 2 inches (36-16 recommended)
 2. Recommended maximum conduit height above floor line 3.50 inches
 3. Maximum conduit space with channel sills 17.5 x 9.73 inches
 4. For multiple structure assemblies either one or both of these members are removed to provide maximum un-restricted conduit space at bottom
 5. This conduit space not recommended when neutral bus required. Otherwise available
- See side View A, far right for vertical dimensions

**20 Inches Wide, 21 Inches Deep
Front Mounted Only (4710A31)**



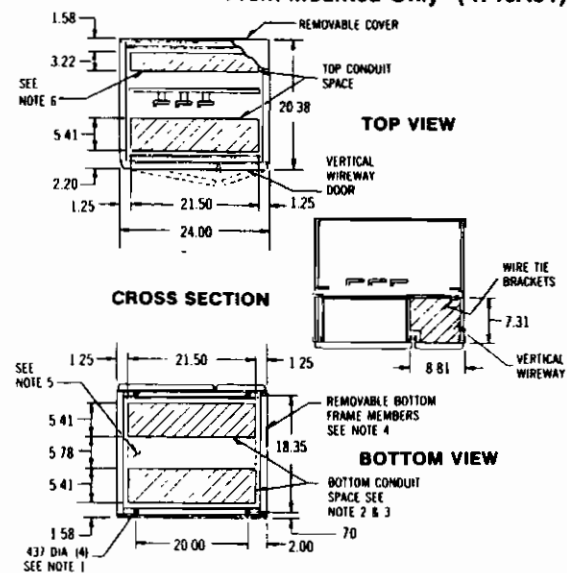
1. Minimum length of anchor bolt 2 inches (36-16 recommended)
 2. Recommended maximum conduit height above floor line 3.50 inches
 3. Maximum conduit space with channel sills 17.5 x 14.11 inches
 4. For multiple structure assemblies either one or both of these members are removed to provide maximum un-restricted conduit space at bottom
 5. This conduit space not recommended when neutral bus required. Otherwise available
 6. Top rear conduit space not recommended for conduit entry in FMO structure
- See side View A, far right for vertical dimensions

**24 Inches Wide, 16 Inches Deep
Front Mounted Only (4710A33)**



1. Minimum length of anchor bolt 2 inches (36-16 recommended)
 2. Recommended maximum conduit height above floor line 3.50 inches
 3. Maximum conduit space with channel sills 21.5 x 9.73 inches
 4. For multiple structure assemblies either one or both of these members are removed to provide maximum un-restricted conduit space at bottom
 5. This conduit space not recommended when neutral bus required. Otherwise available
- See side View A, far right for vertical dimensions

**24 Inches Wide, 21 Inches Deep
Front Mounted Only (4710A34)**



1. Minimum length of anchor bolt 2 inches (36-16 recommended)
 2. Recommended maximum conduit height above floor line 3.50 inches
 3. Maximum conduit space with channel sills 21.5 x 14.11 inches
 4. For multiple structure assemblies either one or both of these members are removed to provide maximum un-restricted conduit space at bottom
 5. This conduit space not recommended when neutral bus required. Otherwise available
 6. Top rear conduit space not recommended for conduit entry in FMO structure
- See side View A, far right for vertical dimensions

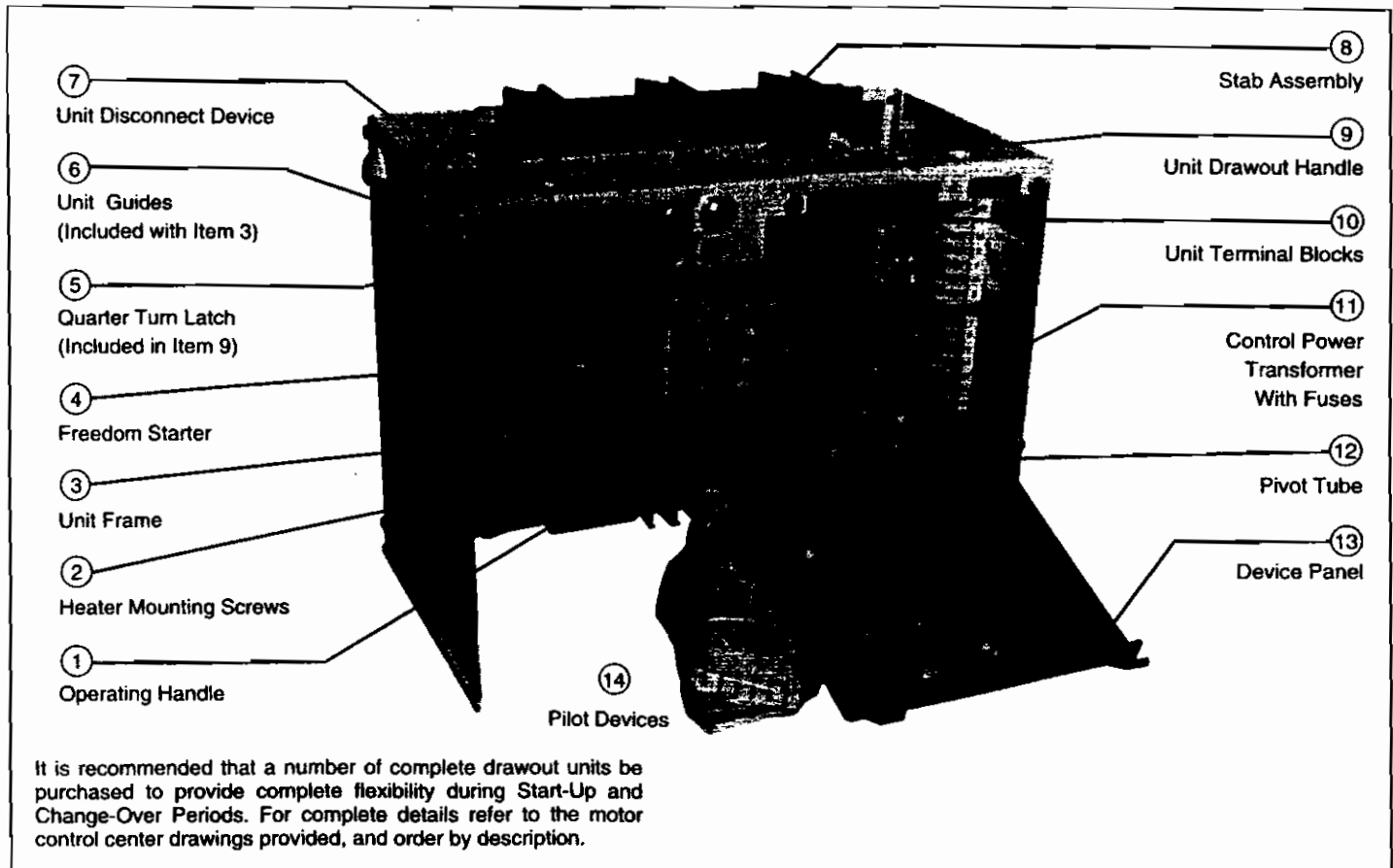


Fig. 41 Control Center Unit Nomenclature

STARTER TYPE	Disconnect Means:	Unit Catalog Number Destination (Class)		
		Fusible	Circuit Breaker	Circuit Breaker With Current Limiter
Description				
Full Voltage, Non-Reversing		F204	F206	F207
Full Voltage, Reversing		F214	F216	F217
Reduced Voltage, Autotransformer Type		F604	F606	F607
Reduced Voltage, Part Winding Type		F704	F706	F707
Reduced Voltage, Closed Transition Star Delta		F894	F896	F897
Full Voltage, Non-Reversing, 2 Speed, 2 Windings		F954	F956	F957
Full Voltage, Non-Reversing, 2-Speed, 1 Windings		F944	F946	F947

RELATED INSTRUCTION LEAFLETS

Starters:

Size 5, non-reversing and reversing, vacuum	I.L. 17087
Size 6, non-reversing and reversing, vacuum	I.L. 17089

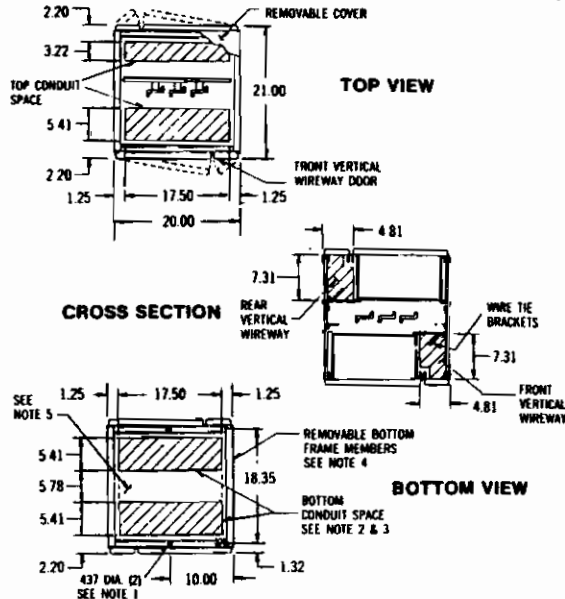
Contactors:

Size 5, non-reversing and reversing, vacuum	I.L. 16999
Size 6, non-reversing and reversing, vacuum	I.L. 17088

Circuit Breakers:

Series C, F-frame	I.L. 29C101
Series C, J-frame	I.L. 29C103
Series C, K-frame	I.L. 29C104
Series C, L-frame	I.L. 29C105
Series C, N-frame	I.L. 29C106
Series C, R-frame	I.L. 29C107
Transfer Switches	I.L. 14477

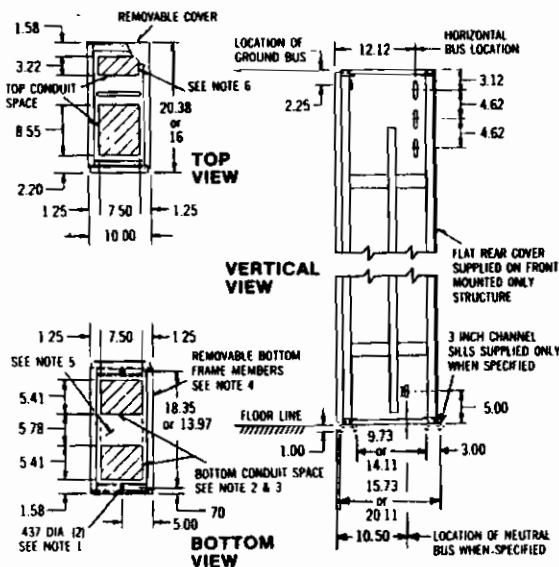
20 Inches Wide, 21 Inches Deep Front and Rear Mounted (4710A32)



1. Minimum length of anchor bolt 2 inches (.36-16 recommended)
2. Recommended maximum conduit height above floor line 3.50 inches
3. Maximum conduit space with channel sills 17.5 x 14.11 inches
4. For multiple structure assemblies either one or both of these members are removed to provide maximum un-restricted conduit space at bottom
5. This conduit space not recommended when neutral bus required. Otherwise available.

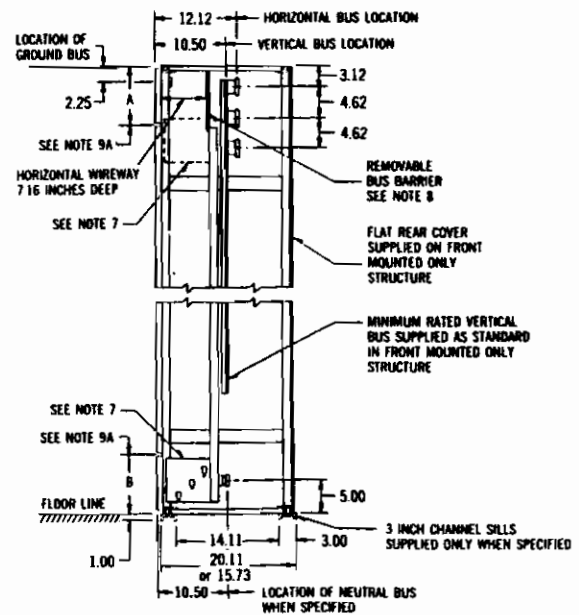
See side View B, far right for vertical dimensions.

10 Inches Wide, 16 or 21 Inches Deep Transition Structures (4710A35/6)



1. Minimum length of anchor bolt 2 inches (.36-16 recommended.)
2. Recommended maximum conduit height above floor line 3.50 inches.
3. Maximum conduit space with channel sills 7.5 x 14.11 inches in 21" deep structure, 7.5 x 9.73 inches in 16" deep structure.
4. For multiple structure assemblies either one or both of these members are removed to provide maximum un-restricted conduit space at bottom
5. This conduit space not recommended when neutral bus required. Otherwise available
6. Top rear conduit space not recommended for conduit entry in 21" deep FMO structure. Space not available in 16" deep structure

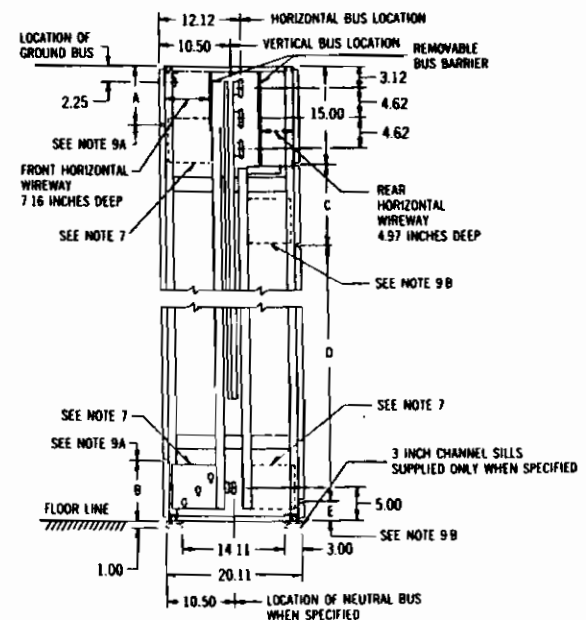
SIDE VIEWS



SIDE VIEW A

Common Notes

7. Master terminal block assembly furnished for Type C wiring only. When location not specified, MTB supplied at the bottom.
8. Rear horizontal bus barrier not supplied with front mounted only structure.
9. Standard structure arrangement
 - (a) In Front
 - Without MTB: A & B = 9"
 - With MTB at bottom: A & B = 9"
 - With MTB at top: A = 15", B = 3"
 - (b) In Rear
 - Without MTB: C = 0, D = 72", E = 3"
 - With MTB at bottom: C = 0, D = 66", E = 9"
 - With MTB at top: C = 12", D = 60", E = 3"



SIDE VIEW B



Distributor Ordering Instructions

1. Specify the item by catalog or style number.
2. Refer to **Price List 8991A** dated November, 1997 for pricing information.
3. Enter the order on **VISTALINE** on suffix **FVU**, or through **COMEX** on suffix **FVU**.
4. Selling Policy 25-000 applies, the discount symbol is **1CD-2C**.

Procedure for Identifying Motor Control Centers Renewal Units and Parts

1. Identify the design of the Motor Control Center (MCC) from the data found on the nameplate.
Critical information includes:
 - Type of MCC
 - Type of contactor
 - Door width
 - Bucket width

In the event that the nameplate is missing or unreadable, follow the procedure on page 3.

2. Refer to the listing below and turn to the section in this Renewal Parts Data to identify replacement units, options, structure parts and unit parts.

	Pages
F2100	4-26

3. For replacement feeder units, refer to the section listed below.

	Page
Replacement Feeder Units (All Vintages)	27

4. This publication identifies those replacement units and parts which are most frequently ordered. Units should be ordered by complete catalog number and parts by complete style number.

For parts not listed or shown, contact your authorized Cutler-Hammer distributor or local Cutler-Hammer sales representative.

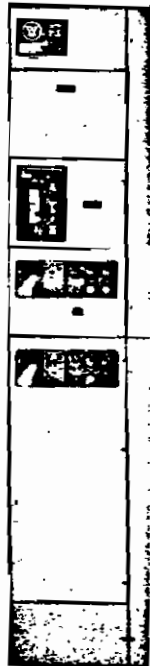
5. If additional assistance is required, contact the Motor Control Center Aftermarket Product Center in Fayetteville, NC at (910) 483-2222 or 1-800-OLD-UNIT or fax (910) 677-5208.

You can also contact one of our eight Service Centers for assistance with F2100, ADVANTAGE, Series 2100 and 5 Star Motor Control Centers.

Atlanta:	770-739-6282 or fax 770-739-7178
Chicago:	847-299-1911 or fax 847-299-0398
Cincinnati:	513-682-4000 or fax 513-682-4004
Denver:	303-371-7844 or fax 303-371-4175
Hartford:	860-653-5061 or fax 860-653-7678
Houston:	713-939-9696 or fax 713-939-0427
Los Angeles:	310-944-6413 or fax 310-941-7178
Portland:	503-636-8333 or fax 503-636-8545



April, 1998
Supplement to Renewal Parts
Data 8991, dated November, 1997



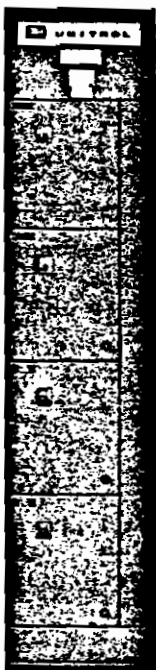
Series 2100 (1987-1995)
5 Star (1975-1987)



Freedom Unitrol
(1988-1994)

Motor Control Center Renewal Parts

Contents	Pages
Distributor Ordering Instructions	2
Procedure for Identifying Units and Parts	2
Procedure for Identifying MCC Types	3
F2100	4
Replacement Starter Units	5-14
Unit Options	15-18
Structure Parts	19-23
Unit Parts	24-26
Replacement Feeder Units (All Vintages)	27



F10 Unitrol
(1972-1989)



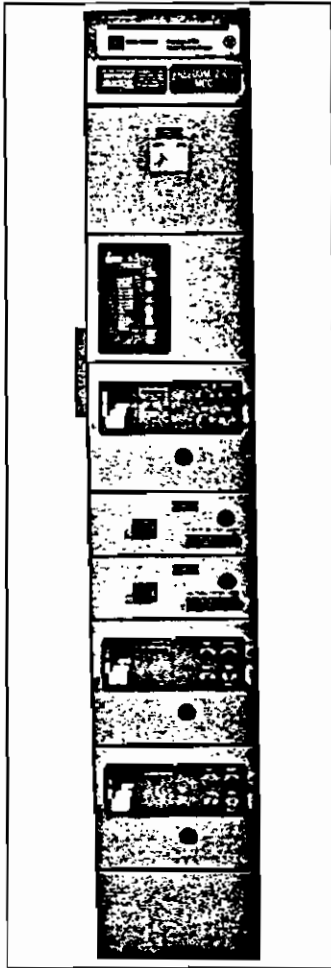
Type W
(1965-1975)



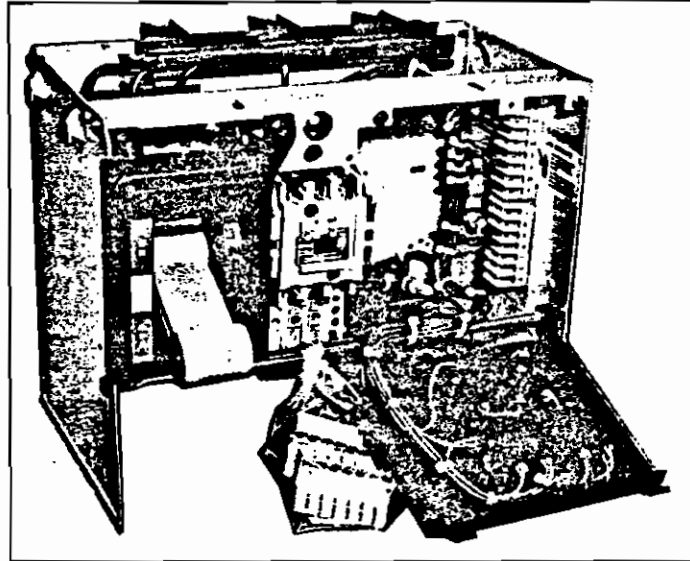
9800 Unitrol
(1956-1974)



11-300
(1935-1965)



F2100 Structure



F2100 Starter Unit

Product Description

Cutler-Hammer introduced the F2100 MCC in 1995.

The structure is based on the 5 Star, Series 2100, and ADVANTAGE MCC design. Vertical structures are normally 20" wide, 90" high, and 16" or 21" deep. Vertical sections may be bolted together forming a single line-up with continuous horizontal bus and open horizontal wireways. Unit height is measured in 6" increments, up to a maximum of 72" of usable vertical space.

A two-tone paint system is used for this design. ANSI 70 is applied to the structural framework and units. ANSI 61 gray is applied to the exterior and doors. Starter units are 13 3/4" wide with 4 5/8" wireways.

The Freedom starter is used in this design along with the HMCP motor circuit protector. The F2100 starter unit's handle mechanism is a gray toggle type handle with a black exterior mounting panel and is used on the Advantage and Series 2100/5 Star designs. Bus and bus support systems are typically braced to withstand fault currents of 65,000A.

Maximum Ratings:

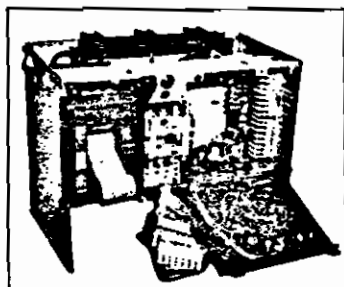
3 phase, 600V, 600 HP, 2500A bus.



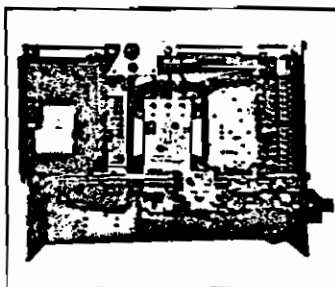
Procedure for Identifying Motor Control Center Types

In the event that the nameplate is missing, it is possible to identify the MCC design by the type of handle mechanism, starter type, bucket width, and door width.

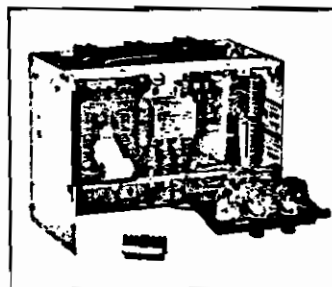
MCC TYPE	TYPE OF HANDLE MECHANISM	STARTER TYPE	BUCKET WIDTH	DOOR WIDTH	PAGE NUMBERS
F2100 (Figure 3.1)	Lever	Freedom Series	13 3/4"	15 5/8"	5-26
ADVANTAGE (Figure 3.2)	Lever	ADVANTAGE	13 3/4"	15 5/8"	29-50
Series 2100 (Figure 3.3)	Lever	A200	13 3/4"	15 5/8"	53-74
Freedom Unitrol (Figure 3.4)	Slider	Freedom Series	13 7/8"	15 1/2"	77-100
5 Star (Figure 3.3)	Lever	A200	13 3/4"	15 5/8"	53-74
F10 Unitrol (Figure 3.5)	Slider	Citation	14"	14 3/4" w/wireway 19 1/2" w/o wireway	103-120
Type W (Figure 3.6)	Slider	A200 or 11-200	11 3/4"	13 3/8"	123-137
9800 Unitrol (Figure 3.7)	Rotary	3 Star	16 1/8"	19 3/8"	139-152
11-300 (Figure 3.8)	Rotary	11-200 Life Line Type N	15 3/4"	20"	155-162



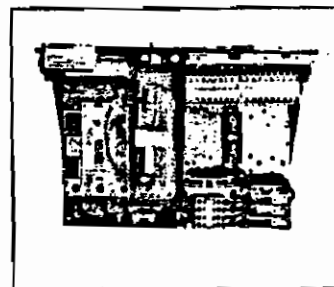
F2100
Figure 3.1



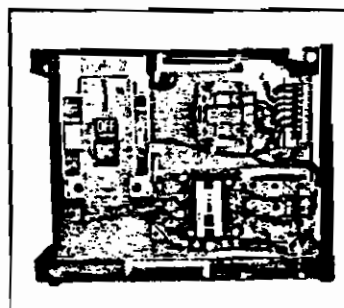
ADVANTAGE
Figure 3.2



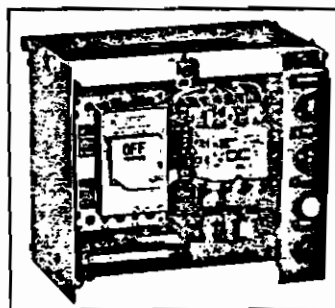
Series 2100/5 Star
Figure 3.3



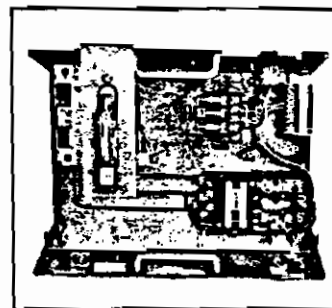
Freedom Unitrol
Figure 3.4



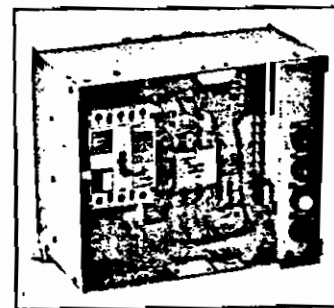
F10 Unitrol
Figure 3.5



Type W
Figure 3.6



9800 Unitrol
Figure 3.7



11-300
Figure 3.8

FZ100

Replacement Starter Units



C = Compact Unit Size
S = Standard Unit Size
X = Oversized Unit

FULL VOLTAGE REVERSING COMBINATION STARTER— HMCP

NEMA Size	Maximum Horsepower					HMCP Size	Catalog Code	Service Voltage	Catalog Code	Control Voltage	Catalog Code	Space Options	Catalog Code
	208V	240V	380V	480V	600V								
1	0.5	0.33	1	1	1.5	3	FZ216A	208	B	120	A	18" HIGH	S
	1	1	2	3	3	7	FZ216B	240	C	208	B		
	3	3	5	7.5	7.5	15	FZ216C	380	D	240	C	24" HIGH	X
	7.5	7.5	10	10	10	30	FZ216D	480	E	380	D		
2	10	15	25	25	25	50	FZ216E	208	B	120	A	18" HIGH	S
								240		208			
								380		240		24" HIGH	X
								480		380			
3	25	30	50	50	50	100	FZ216H	208	B	120	A	24" HIGH	S
								240		208			
								380		240			
								480		380			
4	40	50	75	100	100	100	FZ216L	208	B	120	A	30" HIGH	S
								240		208			
								380		240			
								480		380			
5	50	60	100	125	150	250	FZ216P	208	B	120	A	60" HIGH	S
								240		208			
								380		240			
								480		380			
5	75	100	150	200	200	400	FZ216R	208	B	120	A	60" HIGH	S
								240		208			
								380		240			
								480		380			

FULL VOLTAGE 2 SPEED 1 WINDING — Constant/Variable Torque— HMCP

(For Constant Horsepower instead of Constant/Variable Torque see option SV6 on p. 18)

NEMA Size	Maximum Horsepower					HMCP Size	Catalog Code	Service Voltage	Catalog Code	Control Voltage	Catalog Code	Space Options	Catalog Code
	208V	240V	380V	480V	600V								
1	0.5	0.33	1	1	1.5	3	FZ946A	208	B	120	A	24" HIGH	S
	1	1	2	3	3	7	FZ946B	240	C	208	B		
	3	3	5	7.5	7.5	15	FZ946C	380	D	240	C		
	7.5	7.5	10	10	10	30	FZ946D	480	E	380	D		
2	10	15	25	25	25	50	FZ946E	208	B	120	A	24" HIGH	S
								240		208			
								380		240			
								480		380			
3	25	30	50	50	50	100	FZ946H	208	B	120	A	36" HIGH	S
								240		208			
								380		240			
								480		380			
4	40	50	75	100	100	100	FZ946L	208	B	120	A	36" HIGH	S
								240		208			
								380		240			
								480		380			



F2100 Replacement Starter Units

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How to Order:

When ordering a replacement unit, you receive:

- Series C HMCP
- Freedom Starter
- Unit options as specified
- New steel wrapper, door and handle mechanism
- New stabs
- UL label

Use the following steps for creating a catalog number for your specific application:

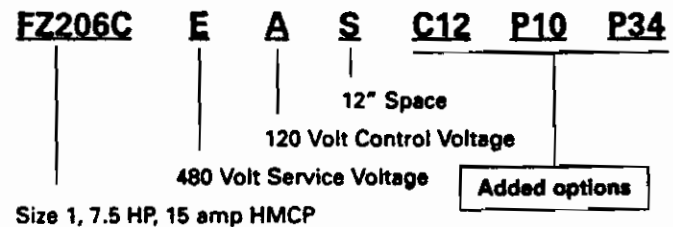
- Step 1** Select the correct replacement unit from pages 5-14. When selecting, you need to know the following:
- MCC Type
 - Class of Unit (FVNR, FVR, Reduced Voltage—Autotransformer or Part Winding or Solid State, FV—2 Speed, 1 Winding or 2 Speed, 2 Winding, etc.)
 - Starter Size or Horsepower Rating
 - Protection Device (breaker or fusible)
 - Service Voltage
 - Control Voltage
 - Space required

Step 2 Verify required space is available.

Step 3 Create a catalog number by selecting catalog codes from the gray columns per the example given.

Step 4 Add modifications as required from the Unit Options on pages 15-18. Space available determines allowable options.

Example:



C = Compact Unit Size
S = Standard Unit Size
X = Oversized Unit

FULL VOLTAGE NON-REVERSING COMBINATION STARTER— HMCP

NEMA Size	Maximum Horsepower					HMCP Size	Catalog Code	Service Voltage	Catalog Code	Control Voltage	Catalog Code	Space Options	Catalog Code
	208V	240V	380V	480V	600V								
1	0.5	0.33	1	1	1.5	3	FZ206A	208	B	120	A	6" HIGH	C
	1	1	2	3	3	7	FZ206B	240	C	208	B	12" HIGH	S
	3	3	5	7.5	7.5	15	FZ206C	380	D	240	C	18" HIGH	X
	7.5	7.5	10	10	10	30	FZ206D	480	E	380	D		
2								575	F	480	E		
										575	F		
3								208	B	120	A	12" HIGH	S
								240	C	208	B	18" HIGH	X
								380	D	240	C		
								480	E	380	D		
4								575	F	480	E		
5								208	B	120	A	18" HIGH	S
								240	C	208	B		
								380	D	240	C		
								480	E	380	D		
6								575	F	480	E		

On 6" units, the only options available are (3) E22 pilot devices and separate source fuse or disconnect or CPT.

FZ100

Replacement Starter Units



C = Compact Unit Size
S = Standard Unit Size
X = Oversized Unit

REDUCED VOLTAGE PART WINDING— HMCP

NEMA Size	Maximum Horsepower					HMCP Size	Catalog Code	Service Voltage	Catalog Code	Control Voltage	Catalog Code	Space Options	Catalog Code
	208V	240V	380V	480V	600V								
1	10	10	15	15	15	30	FZ706D	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	24" HIGH	S
2	20	25	40	40	40	100	FZ706F	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	24" HIGH	S
3	40	50	75	75	75	150	FZ706J	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	30" HIGH	S
4	—	—	—	100	125	250	FZ706L	208 240 380	B C D	120 208 240	A B C	36" HIGH	S
	75	75	150	150	150	400	FZ706M	480 575	E F	380 480 575	D E F		

REDUCED VOLTAGE WYE DELTA OPEN TRANSITION— HMCP

NEMA Size	Maximum Horsepower					HMCP Size	Catalog Code	Service Voltage	Catalog Code	Control Voltage	Catalog Code	Space Options	Catalog Code
	208V	240V	380V	480V	600V								
2	20	25	40	40	40	100	FZ806F	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	42" HIGH	S
3	40	50	75	75	75	150	FZ806J	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	54" HIGH	S
4	60	75	125	150	150	250	FZ806M	208 240 380	B C D	120 208 240	A B C	60" HIGH	S
	—	—	150	—	—	400	FZ806N	480 575	E F	380 480 575	D E F		



F 2100 Replacement Starter Unit

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C = Compact Unit Size
S = Standard Unit Size
X = Oversized Unit

FULL VOLTAGE 2 SPEED 2 WINDING — Constant/Variable Torque— HMCP (For Constant Horsepower instead of Constant/Variable Torque see option SV6 on p. 18)

NEMA Size	Maximum Horsepower					HMCP Size	Catalog Code	Service Voltage	Catalog Code	Control Voltage	Catalog Code	Space Options	Catalog Code
	208V	240V	380V	480V	600V								
1	0.5	0.33	1	1	1.5	3	FZ956A	208	B	120	A	24" HIGH	S
	1	1	2	3	3	7	FZ956B	240	C	208	B		
	3	3	5	7.5	7.5	15	FZ956C	380	D	240	C		
	7.5	7.5	10	10	10	30	FZ956D	480	E	380	D		
2								575	F	480	E	24" HIGH	S
								575		575	F		
3												30" HIGH	S
4												30" HIGH	S

REDUCED VOLTAGE AUTOTRANSFORMER— HMCP

NEMA Size	Maximum Horsepower					HMCP Size	Catalog Code	Service Voltage	Catalog Code	Control Voltage	Catalog Code	Space Options	Catalog Code
	208V	240V	380V	480V	600V								
2								208	B	120	A	36" HIGH	S
								240	C	208	B		
								380	D	240	C		
								480	E	380	D		
3								575	F	480	E	48" HIGH	S
4												48" HIGH	S

● If existing MCC is back-to-back design, 36" in bottom rear is unusable.

F2100

Replacement Starter Units



C = Compact Unit Size
S = Standard Unit Size
X = Oversized Unit

ADJUSTABLE FREQUENCY DRIVE UNITS — HMCP

VOLTS	Maximum Horsepower	HMCP Size	Catalog Code	Service Voltage	Catalog Code	Control Voltage	Catalog Code	Space Options	Catalog Code
240V	1	7	FZ506A	208	B	120	A	24" HIGH	S
	2	15	FZ506B						
	3	15	FZ506C						
	5	30	FZ506D						
240V	7.5	30	FZ506E	240	C			30" HIGH	S
	10	50	FZ506F						
	15	50	FZ506G					36" HIGH	S
	20	50	FZ506H					42" HIGH	S
480 V	2	7	FZ506J	480	E	120	A	24" HIGH	S
	3	7	FZ506K						
	5	15	FZ506L						
	7.5	15	FZ506M					30" HIGH	S
480 V	10	30	FZ506N						
	15	50	FZ506P					36" HIGH	S
480 V	20	50	FZ506R						

FULL VOLTAGE NON-REVERSING — FUSIBLE

Fuse clip ratings shown are based on Class IIC fuses (R Class)

NEMA Size	Maximum Horsepower					Fuse Clip	Catalog Code	Service Voltage	Catalog Code	Control Voltage	Catalog Code	Space Options	Catalog Code
	208V	240V	380V	480V	600V								
1	7.5	7.5	10	10	10	30A	FZ204C	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	6" HIGH 12" HIGH 18" HIGH	C ● S X
2	—	—	15	15	25	30A	FZ204E	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	12" HIGH 18" HIGH	S X
	10	15	25	25	—	60A	FZ204F						
3	—	20	30	40	50	60A	FZ204H	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	24" HIGH	S
	25	30	50	50	—	100A	FZ204J						
4	—	—	—	60	75	100A	FZ204L	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	48" HIGH	S
	50	50	60	100	100	200A	FZ204M						
5	60	60	100	150	150	200A	FZ204P	208 240 380 480 575	B C D E F	120 208 240 380 480	A B C D E	60" HIGH	S
	100	100	150	200	200	400A	FZ204R						

● On 6" units, the only options available are (3) E22 pilot devices and separate source fuse or disconnect or CPT.



F2100

Replacement Starter Units

Renewal Parts Data Supplement

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C = Compact Unit Size
S = Standard Unit Size
X = Oversized Unit

REDUCED VOLTAGE WYE DELTA CLOSED TRANSITION— HMCP (Non-Chiller Application)

NEMA Size	Maximum Horsepower					HMCP Size	Catalog Code	Service Voltage	Catalog Code	Control Voltage	Catalog Code	Space Options	Catalog Code
	208V	240V	380V	480V	600V								
2	20	25	40	40	40	100	FZ896F	208	B C D E F	120	A B C D E F	42" HIGH	S
								240		208			
								380		240			
								480		380			
								575		480			
3	40	50	50	50	50	100	FZ896J	208	B C D E F	120	A B C D E F	54" HIGH	S
								240		208			
								380		240			
								480		380			
								575		480			
4	60 —	75 —	125 150	150 —	150 —	250 400	FZ896M FZ896N	208	B C D E F	120	A B C D E F	60" HIGH	S
								240		208			
								380		240			
								480		380			
								575		480			

REDUCED VOLTAGE SOLID STATE STARTER EASY START EJ®— HMCP

NEMA Size	Starter Max. Rating	Maximum Horsepower				HMCP Size	Catalog Code	Service Voltage	Catalog Code	Control Voltage	Catalog Code	Space Options	Catalog Code
		208V	380V	480V	600V								
1	11 AMPS	0.5	0.33	1	1.5	3	FZ306A	208	B C D E F	120	A B C D E F	24" HIGH	S
		1	1	3	3	7	FZ306B	240		208			
		3	3	7.5	7.5	15	FZ306C	380		240			
		7.5	7.5	10	10	30	FZ306D	480		380			
2	21 AMPS	5	7.5	15	20	50	FZ306E	575	B C D E F	575	A B C D E F	24" HIGH	S
								208		120			
								240		208			
								380		240			
								480		380			
3	40 AMPS	10	15	30	40	100	FZ306H	575	B C D E F	575	A B C D E F	36" HIGH	S
								208		120			
								240		208			
								380		240			
								480		380			
4	100 AMPS	30	30	75	100	150	FZ306L	575	B C D E F	575	A B C D E F	36" HIGH	S
								208		120			
								240		208			
								380		240			
								480		380			

● Consult the factory for Easy Start EJ options.

F 2100

Replacement Starter Units



FULL VOLTAGE 2 SPEED 2 WINDING— FUSIBLE

Constant/Variable Torque

(For Constant Horsepower instead of Constant/Variable Torque see option SV6 on p. 18)

Fuse clip ratings shown are based on Class IIC fuses (R Class)

C = Compact Unit Size
S = Standard Unit Size
X = Oversized Unit

NEMA Size	Maximum Horsepower					Fuse Clip	Catalog Code	Service Voltage	Catalog Code	Control Voltage	Catalog Code	Space Options	Catalog Code
	208V	240V	380V	480V	600V								
1	7.5	7.5	10	10	10	30A	FZ954C	208	B C D E F	120	A B C D E F	24" HIGH	S
								240		208			
								380		240			
								480		380			
								575		480			
2	— 15	— 15	15 25	15 25	25 —	30A 60A	FZ954E FZ954F	208	B C D E F	120	A B C D E F	24" HIGH	S
								240		208			
								380		240			
								480		380			
								575		480			
3	— 25	20 30	30 50	40 50	50 —	60A 100A	FZ954H FZ954J	208	B C D E F	120	A B C D E F	36" HIGH	S
								240		208			
								380		240			
								480		380			
								575		480			
4	— 50	— 50	— 60	60 100	75 100	100A 200A	FZ954L FZ954M	208	B C D E F	120	A B C D E F	54" HIGH	S
								240		208			
								380		240			
								480		380			
								575		480			

REDUCED VOLTAGE AUTOTRANSFORMER— FUSIBLE

Fuse clip ratings shown are based on Class IIC fuses (R Class)

NEMA Size	Maximum Horsepower					Fuse Clip	Catalog Code	Service Voltage	Catalog Code	Control Voltage	Catalog Code	Space Options	Catalog Code
	208V	240V	380V	480V	600V								
2	— 10	— 15	15 25	15 25	25 —	30A 60A	FZ604E FZ604F	208	B C D E F	120	A B C D E F	36" HIGH	S
								240		208			
								380		240			
								480		380			
								575		480			
3	— 25	20 30	30 50	40 50	50 —	60A 100A	FZ604H FZ604J	208	B C D E F	120	A B C D E F	54" HIGH	S
								240		208			
								380		240			
								480		380			
								575		480			
4	— 50	— 50	— 60	60 100	75 100	100A 200A	FZ604L FZ604M	208	B C D E F	120	A B C D E F	72" HIGH	S ●
								240		208			
								380		240			
								480		380			
								575		480			

● If existing MCC is back-to-back design, 36" in bottom rear is unusable.



F 2100 Replacement Starter Units

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C = Compact Unit Size
S = Standard Unit Size
X = Oversized Unit

FULL VOLTAGE REVERSING — FUSIBLE

Fuse clip ratings shown are based on Class IIC fuses (R Class)

NEMA Size	Maximum Horsepower					Fuse Clip	Catalog Code	Service Voltage	Catalog Code	Control Voltage	Catalog Code	Space Options	Catalog Code
	208V	240V	380V	480V	600V								
1	7.5	7.5	10	10	10	30A	FZ214C	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	24" HIGH	S
2	—	—	15	15	25	30A	FZ214E	208 240 380	B C D E F	120 208 240 380	A B C D E F	24" HIGH	S
	10	15	25	25	—	60A	FZ214F	480 575	D E F	480 575	D E F		
3	—	20	30	40	50	60A	FZ214H	208 240 380	B C D E F	120 208 240 380	A B C D E F	30" HIGH	S
	25	30	50	50	—	100A	FZ214J	480 575	D E F	480 575	D E F		
4	—	—	—	60	75	100A	FZ214L	208 240 380	B C D E F	120 208 240 380	A B C D E F	54" HIGH	S
	50	50	60	100	100	200A	FZ214M	480 575	D E F	480 575	D E F		

FULL VOLTAGE 2 SPEED 1 WINDING— FUSIBLE

Constant/Variable Torque

(For Constant Horsepower instead of Constant/Variable Torque see option SV6 on p. 18)

Fuse clip ratings shown are based on Class IIC fuses (R Class)

NEMA Size	Maximum Horsepower					Fuse Clip	Catalog Code	Service Voltage	Catalog Code	Control Voltage	Catalog Code	Space Options	Catalog Code
	208V	240V	380V	480V	600V								
1	7.5	7.5	10	10	10	30A	FZ944C	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	24" HIGH	S
2	—	—	15	15	25	30A	FZ944E	208 240 380	B C D E F	120 208 240 380	A B C D E F	36" HIGH	S
	10	15	25	25	—	60A	FZ944F	480 575	D E F	480 575	D E F		
3	—	20	30	40	50	60A	FZ944H	208 240 380	B C D E F	120 208 240 380	A B C D E F	36" HIGH	S
	25	30	50	50	—	100A	FZ944J	480 575	D E F	480 575	D E F		
4	—	—	—	60	75	100A	FZ944L	208 240 380	B C D E F	120 208 240 380	A B C D E F	60" HIGH	S
	50	50	60	100	100	200A	FZ944M	480 575	D E F	480 575	D E F		

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Replacement Starter Units



C = Compact Unit Size
S = Standard Unit Size
X = Oversized Unit

REDUCED VOLTAGE WYE DELTA CLOSED TRANSITION— FUSIBLE (Non-Chiller Application)

Fuse clip ratings shown are based on Class IIC fuses (R Class)

NEMA Size	Maximum Horsepower					Fuse Clip	Catalog Code	Service Voltage	Catalog Code	Control Voltage	Catalog Code	Space Options	Catalog Code
	208V	240V	380V	480V	600V								
2	15	15	30	40	40	60A	FZ894F	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	30" HIGH	S
	20	25	40	—	—	100A	FZ894G					36" HIGH	S
3	25	30	50	60	75	100A	FZ894J	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	48" HIGH	S
	40	50	75	75	—	200A	FZ894K						
4	50	60	100	125	150	200A	FZ894M	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	60" HIGH	S
	60	75	150	150	—	400A	FZ894N					72" HIGH	S

FULL VOLTAGE NON-REVERSING VACUUM STARTERS — FUSIBLE

Fuse clip ratings shown are based on Class IIC fuses (R Class)

NEMA Size	Maximum Horsepower					Fuse Clip	Catalog Code	Service Voltage	Catalog Code	Control Voltage	Catalog Code	Space Options	Catalog Code
	208V	240V	380V	480V	600V								
4	—	—	—	60	75	100A	FZV04L	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	36" HIGH	S
	50	50	60	100	100	200A	FZV04M						
5	60	60	100	150	150	200A	FZV04P	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	36" HIGH	S
	100	100	150	200	200	400A	FZV04R					48" HIGH	S



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REDUCED VOLTAGE PART WINDING— FUSIBLE

Fuse clip ratings shown are based on Class IIC fuses (R Class)

C = Compact Unit Size
S = Standard Unit Size
X = Oversized Unit

NEMA Size	Maximum Horsepower					Fuse Clip	Catalog Code	Service Voltage	Catalog Code	Control Voltage	Catalog Code	Space Options	Catalog Code
	208V	240V	380V	480V	600V								
1	10	10	15	15	15	60A	FZ704D	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	24" HIGH	S
	—	15	25	30	40	60A	FZ704F	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	24" HIGH	S
2	20	25	40	40	—	100A	FZ704G	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	24" HIGH	S
	—	—	—	50	60	100A	FZ704J	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	48" HIGH	S
3	40	50	75	75	75	200A	FZ704K	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	48" HIGH	S
	—	—	—	50	60	100A	FZ704J	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	48" HIGH	S
4	50	—	100	100	150	200A	FZ704M	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	54" HIGH	S
	75	75	150	150	—	400A	FZ704N	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	54" HIGH	S

REDUCED VOLTAGE WYE DELTA OPEN TRANSITION— FUSIBLE

Fuse clip ratings shown are based on Class IIC fuses (R Class)

NEMA Size	Maximum Horsepower					Fuse Clip	Catalog Code	Service Voltage	Catalog Code	Control Voltage	Catalog Code	Space Options	Catalog Code
	208V	240V	380V	480V	600V								
2	15	15	30	40	40	60A	FZ804F	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	30" HIGH	S
	20	25	40	—	—	100A	FZ804G	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	36" HIGH	S
3	25	30	50	60	75	100A	FZ804J	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	36" HIGH	S
	40	50	75	75	—	200A	FZ804K	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	48" HIGH	S
4	50	60	100	125	150	200A	FZ804M	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	60" HIGH	S
	60	75	150	150	—	400A	FZ804N	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	72" HIGH	S
5	100	125	200	250	300	400A	FZ804R	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	48" HIGH	S
	150	150	250	300	—	600A	FZ804T	208 240 380 480 575	B C D E F	120 208 240 380 480 575	A B C D E F	72" HIGH	S

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Unit Options



Minimum Unit Size Required
(Refer to Replacement Unit pages)

Option suffix	Description	Space Req'd

E (Adjustable Frequency Drive AF93 options)
Available only with F2100, ADVANTAGE, Series 2100/5 Star, and Freedom Unitrol

Consult factory for price and spacing requirements.

G (Ground fault protection options)

G10	Class 1 ground fault protection-GRT1 size 1-4 (includes shunt trip in breaker)	X
G11	Class 1 ground fault protection-GRT1 size 5-6 (includes shunt trip in breaker)	X
G12	Ground fault test panel	X

M (Metering options)

M10	Mini voltmeter	C ●
M11	Mini ammeter with current transformer	S
M12	Mini elapsed time meter	C ●
M13	Current transformer for remote metering	S
M14	Current transducer 4-20ma output	X

Q (Overload options)

Q10	IQ 500 solid state overload relay (Westinghouse vintages)	S
Q11	IQ 500 load protection modules (includes LAM, JAM, and ULM)	S
Q16	Bell alarm contact (1NO) wired to terminal block	C
Q17	Bi-metallic overload substitution for F10 or 9800 series (std is eutectic alloy)	C
Q18	Adjustable A200 overload substitution for Westinghouse vintages	C ●

● Not available in 6" units



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Option Groups (Select your option suffix and attach it to the end of the catalog number.)

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A	Advantage options	15
B	Circuit Breaker options	15
C	Control power source options	16
F	Adjustable Frequency Drive options (refer to PL8912 or PL8915 for other drive offerings)	16
G	Ground fault protection options	16
M	Metering options	16
O	Overload options	16
P	Pilot device options	17
R	Relay and Timer (control, voltage, current) options	18
S	Starter options including extra contacts	18
T	Terminal block options	18
U	Unit wiring options	18

Minimum Unit Size Required
(Refer to Replacement Unit pages)

Option suffix	Description	Space Req'd

B (Breaker options)

B10	Shunt trip 120V-AC wired to terminal blocks for remote tripping	C
B11	Auxiliary switch form C (1NO/1NC) wired to terminal blocks	C
B12	Form C Bell alarm contact (1NO/1NC) wired to terminal blocks	C
B13	Undervoltage release	C
B14	IQ Energy Sentinel - F Frame - (consult factory for spacing)	
B15	IQ Energy Sentinel - J Frame - (consult factory for spacing)	
B16	IQ Energy Sentinel - K Frame - (consult factory for spacing)	
B17	IQ Central Energy Display - (consult factory for spacing)	
B18	Thermal Magnetic Circuit Breaker instead of HMCP	

C (Control power source options)

C10	Control fuse wired for separate source, qty. 1	C
C11	Control fuse with disconnect wired for separate source, qty. 1	C
C12	Control power transformer 100VA for size 1 or 2 starter (includes 2 primary + 1 secondary fuse)	C ●
C13	Control power transformer 150VA for size 3 or 4 starter (includes 2 primary + 1 secondary fuse)	C
C14	Control power transformer 100VA with interposing relay for size 5 starter	C
C15	Extra 50 VA for CPT	S
C16	Extra 100 VA for CPT	S
C17	Service voltage control includes 2 primary fuses	C

● Not available in 6" units

F2100

Unit Options



Minimum Unit Size Required
(Refer to Replacement Unit pages)

Option suffix	Description	Space Req'd
R	(Relay and Timer options)	
R10	Aux control relay 2 pole (1NO/1NC) convertible contacts wired in parallel with starter coil	S
R11	Aux control relay 4 pole (2NO/2NC) convertible contacts wired in parallel with starter coil	S
R12	Aux control relay 2 pole Overload Alarm (1NO/1NC) convertible contacts	S
R13	Mechanical latching relay (specify connection)	X
R14	Ice cube relay 300V 3 pole blade type (specify connection)	S
R15	Phase voltage relay type SVM3	X
R16	Current sensing relay with contacts wired to terminal blocks	X
R17	Deceleration timing relay (Pneumatic "OFF" Delay)	S
R18	Compelling timer (Pneumatic "ON" Delay)	S
R19	Time clock 24 hour (consult factory for spacing)	
R20	Time clock 7 day (consult factory for spacing)	
R21	Solid state timer type TR (specify connection)	S

S (Starter contact options – maximum of 8 contacts)

S	To order extra starter contacts, you must specify the number of normally open/normally closed contacts, given a maximum of eight (8). To define the unit option required, create a suffix based on the following: Example: Qty. of normally open contacts 2 3 Qty. of normally closed contacts

SV (Vacuum starter options)

SV4	Vacuum starter size 4 substitution FVNR (consult factory for spacing)
SV5	Vacuum starter size 5 substitution FVNR (consult factory for spacing)
SV6	Constant Horsepower instead of constant/variable torque

I (Terminal block options)

T10	Pull-apart type (std. on all vintages except TYPE W and 11300)	S
T11	Utility screw type (add 6" for every 18 points)	
T12	Front-mounted pull-apart type for F2100, ADVANTAGE, Series 2100/5 Star	S

U (Unit wiring options)

U10	Surge suppressor on coil	C
U11	Type SIS control wire	C
U12	Type SIS power wire	C
U13	Type 14 ga. control wire (std. for all vintages except F2100, Series 2100/5 Star, Type W and 11-300)	C
U14	Wiremarkers sleeve type on all control wire	C
U15	Locking fork terminals on all control wiring	S
U16	Ring wire terminals on power wiring	S
U17	Wiring diagram inside starter unit door	C



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Minimum Unit Size Required
(Refer to Replacement Unit pages)

Option suffix	Description	Space Req'd
P	(Pilot device options)⓪	
P10	Light red "RUN" (2 lights supplied for reversing and multispeed)	C
P11	Light green "STOPPED"	C
P12	Light amber "OVERLOAD TRIPPED" (wired through overload bell alarm contact)	C
P13	Same as option P10 except green	C
P14	Same as option P11 except red	C
P15	Light push-to-test same as option P10	C
P16	Light push-to-test same as option P11	C
P17	Light push-to-test same as option P12	C
P18	Light push-to-test same as option P13	C
P19	Light push-to-test same as option P14	C
P20	Light special (supply description)	C
P30	Pushbutton "START"	C
P31	Pushbutton "STOP"	C
P32	Pushbutton "START/STOP" combination	C
P33	Pushbutton "ON"	C
P34	Pushbutton "OFF"	C
P35	Pushbutton "ON/OFF" combination	C
P36	Pushbutton "FORWARD/REVERSE/STOP" combination	C
P37	Pushbutton "FAST/SLOW/STOP" combination	C
P38	Pushbutton "FAST/OFF/SLOW" combination	C
P39	Pushbutton "HIGH/LOW/STOP" combination	C
P40	Pushbutton "HIGH/LOW/OFF" combination	C
P41	Pushbutton special (supply description)	C
P50	Selector switch 2 position "ON-OFF"	C
P51	Selector switch 2 position "HIGH-LOW"	C
P52	Selector switch 2 position "OFF-AUTO"	C
P53	Selector switch 2 position "START-STOP"	C
P54	Selector switch 2 position "SLOW-FAST"	C
P55	Selector switch 2 position "FORWARD-REVERSE"	C
P56	Selector switch 2 position special (supply description)	C
P57	Selector switch 3 position "HAND-OFF-AUTO"	C
P58	Selector switch 3 position "LOCAL-OFF-REMOTE"	C
P59	Selector switch 3 position "FAST-OFF-SLOW"	C
P60	Selector switch 3 position "HIGH-OFF-LOW"	C
P61	Selector switch 3 position special (supply description)	C
P62	Selector switch 4 position "HIGH-LOW-OFF-AUTO"	C
P63	Selector switch 4 position special (supply description)	C

⓪ Only E22 pushbuttons available in 6" units (3 maximum)

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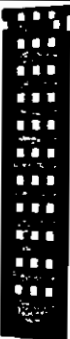
Structure Parts



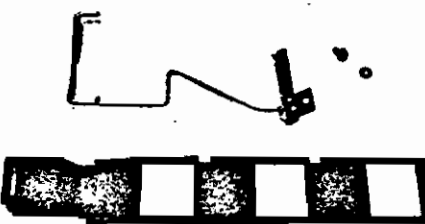
① Blank Unit Door with mounting hardware

Description	Style No.
6" high x 15 1/2" wide	4719A91G20
12" high x 15 1/2" wide	4719A91G21
18" high x 15 1/2" wide	4719A91G22
24" high x 15 1/2" wide	4719A91G23
30" high x 15 1/2" wide	4719A91G24
36" high x 15 1/2" wide	4719A91G25

② Vertical Bus Barrier Kits

Description	Style No.
 Standard flat barrier kit includes one flat barrier, 12 covers and clips.	4719A91G13
 Labyrinth barrier kit includes front and rear barrier, bus supports and hardware (does not include shutters).	4719A91G14

Shutter Kit

	
Description	Style No.
Kit includes shutter, spring loaded coupler and mounting screws.	4719A91G15

③ Sheet Metal Covers with mounting hardware

Description	Style No.	Description	Style No.
Side Sheets:		Top Sheets:	
16" deep, front mounted	4719A91G31	20" wide x 16" front mtd.	4719A91G36
21" deep, front mounted	4719A91G32	20" wide x 21" front mtd.	4719A91G37
21" deep, back-to-back mtd.	4719A91G33	20" wide x 21" back-to-back mtd.	4719A91G38
Rear Sheets:		24" wide x 16" front mtd.	4719A91G39
20" wide x 90" high	4719A91G34	24" wide x 21" front mtd.	4719A91G40
24" wide x 90" high	4719A91G35		

Touch-up Paint Kit

Description	Style No.
Kit includes three spray cans of ANSI-61 Gray.	4719A91G10

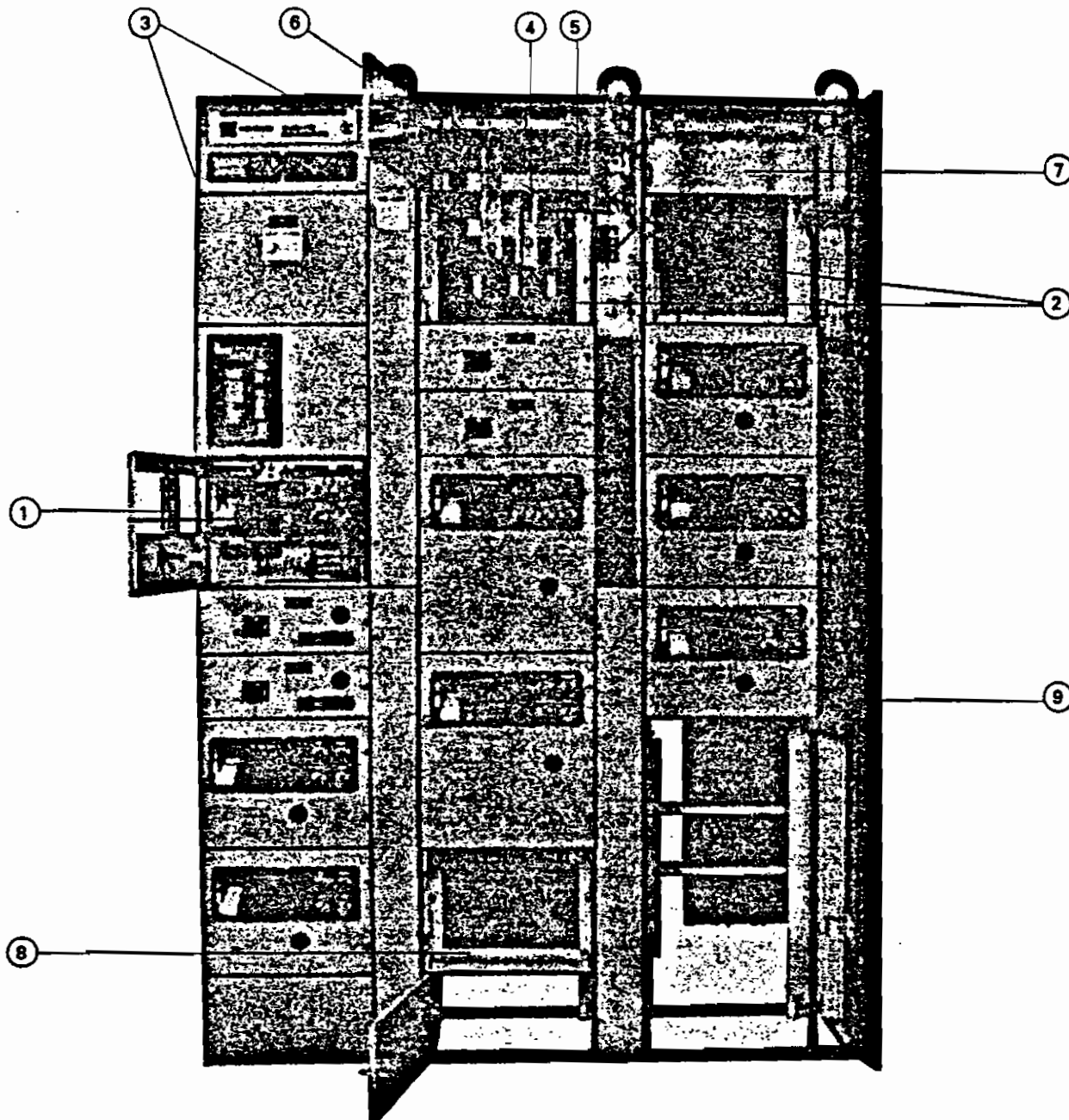


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Structure Parts

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①	Blank unit door	20	⑥	Horizontal wireway door	22
②	Vertical bus barrier	20	⑦	Horizontal bus barriers	22
	Shutter kit	20	⑧	Divider pan / Guide rails	22
③	Top and side sheet metal covers	20	⑨	Vertical wireway door	22
	Touch-up paint kit	20		Horizontal to vertical bus connection kit	22
④	Vertical bus	21		Horizontal bus insulator kit	23
	Vertical bus insulation kit	21		Door mounting hardware kit	23
⑤	Horizontal bus	21		Horizontal bus splice kit	23

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Structure Parts



⑥ Horizontal Wireway Door Kit

	
Description	Style No.
Kit includes door, hinges, hinge pins and mounting hardware. 9" high x 15 1/2" wide (Std. kit of 2)	4719A91G18
(1) 15" high x 15 1/2" wide, (1) 3" high	4719A91G19

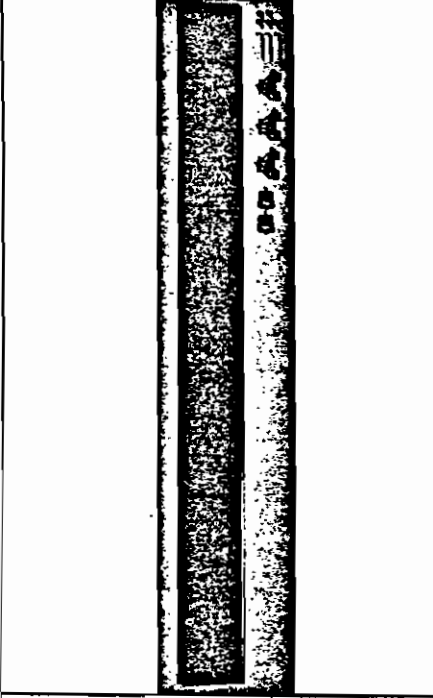
⑦ Horizontal Bus Barrier Kit

	
Description	Style No.
Kit includes divider pan, horizontal and vertical barriers, junction piece, and mounting hardware.	
9" high, front mounted	4719A91G02
15" high, front mounted	4719A91G03
15" high, rear mounted	4719A91G04

⑧ Divider Pan/Guide Rails with mounting hardware

	
Style No.	4719A91G05

⑨ Vertical Wireway Door Kit

	
Description	Style No.
Kit includes 4" x 45" door, hinges, hinge pins and mounting hardware.	4719A91G17

Horizontal to Vertical Bus Connection Kit

Kit includes bus spacers with mounting hardware.

<u>Horizontal Bus</u>		<u>Vertical Bus</u>		Style No.
Ampere Rating	Bars/Phase	Ampere Rating	Material	
600	1	300	Cu	4719A97G64
		600	Cu	4719A97G65
800	2	300	Cu	4719A97G72
		600	Cu	4719A97G73
		800	Cu	4719A97G74
1200	3	300	Cu	4719A97G80
		600	Cu	4719A97G81
		800	Cu	4719A97G82
		1200	Cu	4719A97G84



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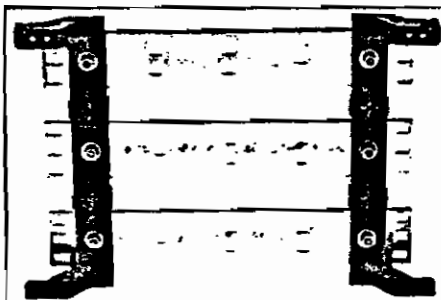
④ Vertical Bus Bar 65,000 Ampere RMS Bus Bracing

	Ampere Rating	Type Mounting	Style No.
	Copper only		
	300	Front	4719A80G01
	600	Front/back-to-back	4719A80G02
	800	Front	4719A80G04
	1200	Front	4719A80G05

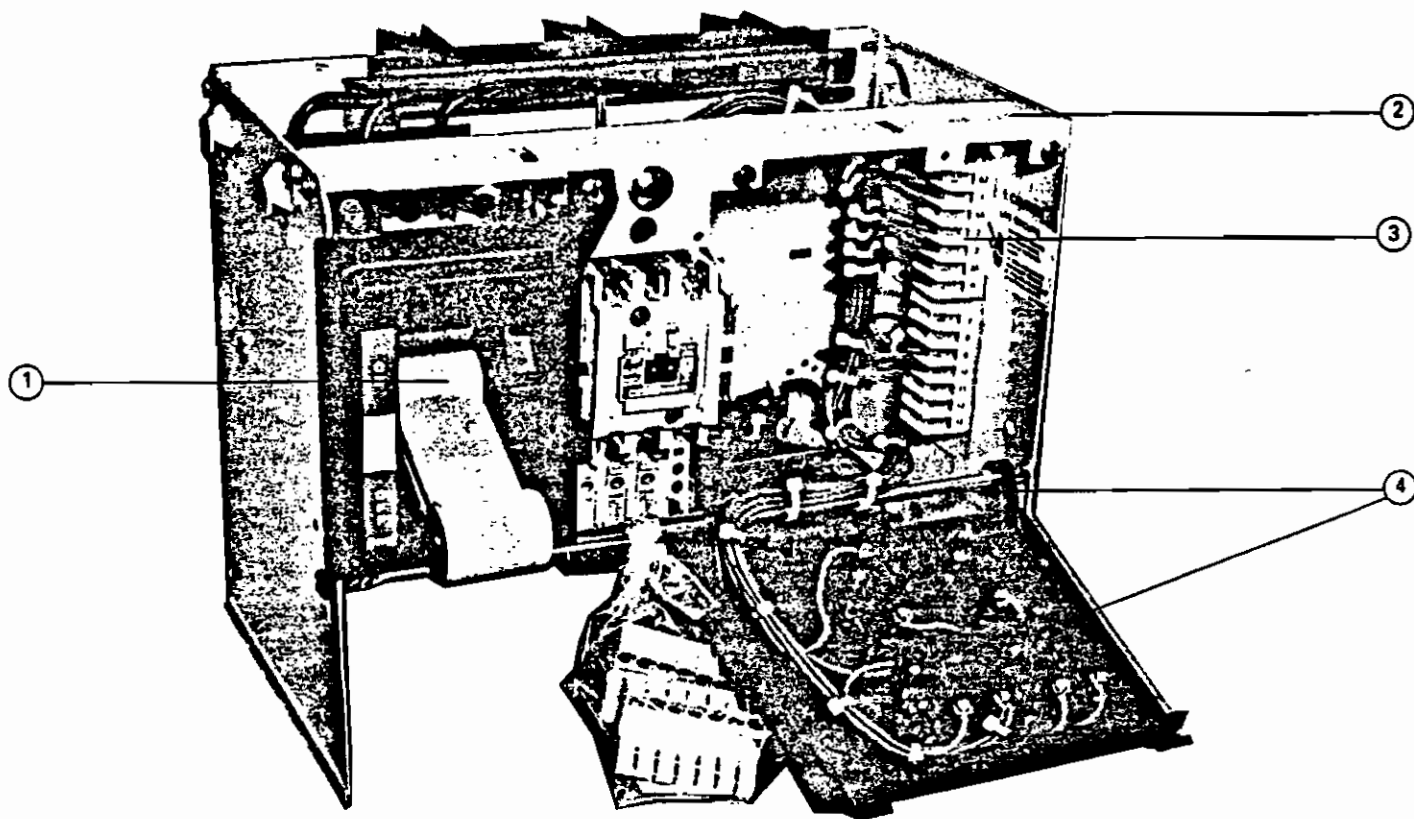
Vertical Bus Insulation Kit

Description	Style No.
Kit includes 2 insulators, 2 mounting brackets and mounting hardware.	4719A91G12

⑤ Horizontal Bus Bar 65,000 Ampere RMS Bus Bracing



Structures		Bar Size	Bars/ Phase	Ampere Rating		Style No.
No.	Width			UL 50°C	NEMA 65°C	
Aluminum						
1	20"	.25" x 2.00"	1	600	600	4719A97G01
2	40"					4719A97G02
3	60"					4719A97G03
1	20"	.25" x 3.50"	1	—	800	4719A97G04
2	40"					4719A97G05
3	60"					4719A97G06
1	20"	.25" x 2.00"	2	800	1000	4719A97G07
2	40"					4719A97G08
3	60"					4719A97G09
1	20"	.25" x 3.50"	2	1000	1200	4719A97G10
2	40"					4719A97G11
3	60"					4719A97G12
1	20"	.25" x 2.50"	3	1200	—	4719A97G13
2	40"					4719A97G14
3	60"					4719A97G15
Silver Plated Copper						
1	20"	.25" x 2.00"	1	600	600	4719A97G28
2	40"					4719A97G29
3	60"					4719A97G30
1	20"	.25" x 2.50"	1	—	800	4719A97G31
2	40"					4719A97G32
3	60"					4719A97G33
1	20"	.25" x 3.50"	1	—	1000	4719A97G34
2	40"					4719A97G35
3	60"					4719A97G36
1	20"	.25" x 2.00"	2	—	1200	4719A97G37
2	40"					4719A97G38
3	60"					4719A97G39
1	20"	.25" x 3.00"	1	800	—	4719A97G40
2	40"					4719A97G41
3	60"					4719A97G42
1	20"	.25" x 3.50"	2	1200	—	4719A97G43
2	40"					4719A97G44
3	60"					4719A97G45



Page

		Page			Page
①	Operating handle mechanism	25		Control transformers	25
	Overload reset button and reset rod ext. kit	25		Primary/secondary fuse holder kit	25
②	Unit drawout top rail	25	④	Device panel/Pivot tube	26
③	Terminal blocks	25		Fusible disconnect block kit	26



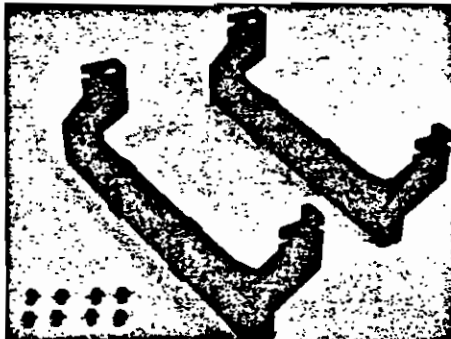
F 2100 Structure Parts

Renewal Parts Data Supplement

8991a

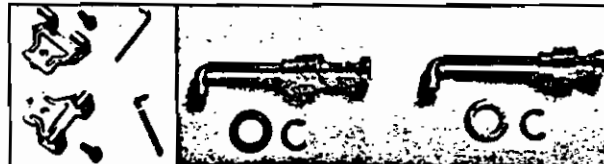
Page 23

Horizontal Bus Insulator Kit



Description	Style No.
Kit includes 2 insulators with mounting hardware.	4719A91G11

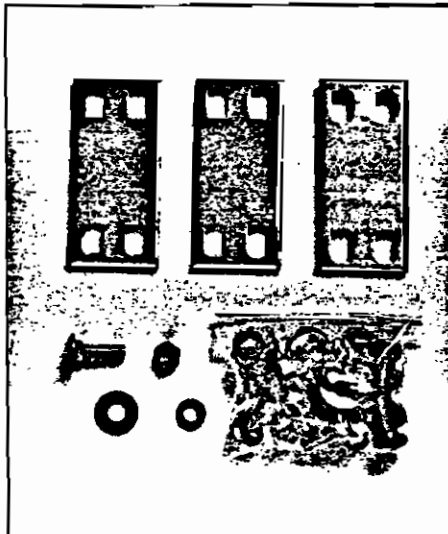
Door Mounting Hardware Kit



Description	Style No.
Kit includes 2 hinges, hinge pins and (2) 1/4 turn latches.	4719A91G26

Horizontal Bus Splice Kit

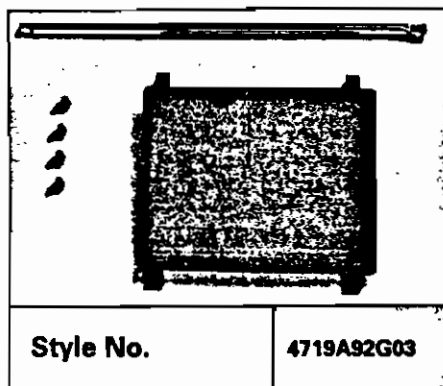
Kit includes bus splice plates with mounting hardware.



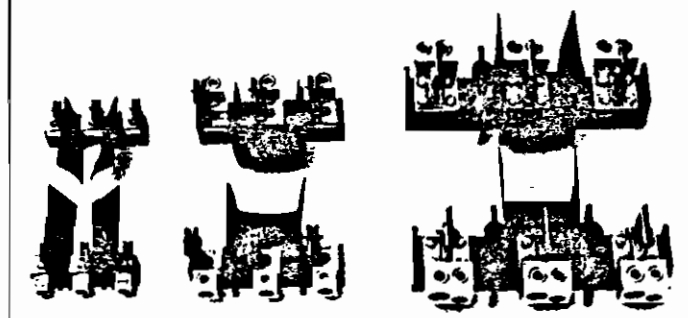
Bus Rating, Amps		Bus Size	Bars/ Phase	Style No.
UL (50°C)	NEMA (65°C)			
Aluminum				
600	600	2.00"	1	4719A97G92
—	800	3.50"	1	4719A97G93
800	1000	2.00"	2	4719A97G94
1000	1200	3.50"	2	4719A97G95
1200	—	2.50"	3	4719A97G96
Copper (Silver Plated)				
600	600	2.00"	1	4719A97G86
—	800	2.50"	1	4719A97G87
800	—	3.00"	1	4719A97G88
—	1000	3.50"	1	4719A97G89
1000	1200	2.00"	2	4719A97G90
1200	1400	2.50"	2	4719A97G91



④ **Device Panel/Pivot Tube
with mounting hardware**



Fusible Disconnect Block Kit^{①②}

			Description	Style No.
 100 Amp 200 Amp 400 Amp			Kit includes line and load blocks with clips.	
			30A Non-rejection	4719A92G33
			30A Rejection	4719A92G34
			60A Non-rejection	4719A92G35
			60A Rejection	4719A92G36
			100A Non-rejection	4719A92G37
			100A Rejection	4719A92G38
			200A Non-rejection	4719A92G39
			200A Rejection	4719A92G40
			400A Non-rejection	4719A92G41
			400A Rejection	4719A92G42

- ① Certain fusible designs have line fuse clips mounted on the DS Switch. Non-rejection clips can be removed from the mounting block and mounted on the switch. Rejection clips are non-removable. Order a complete switch assembly.
- ② For MCC's built after October, 1984, consult factory for specific details.



F2100 Unit Parts

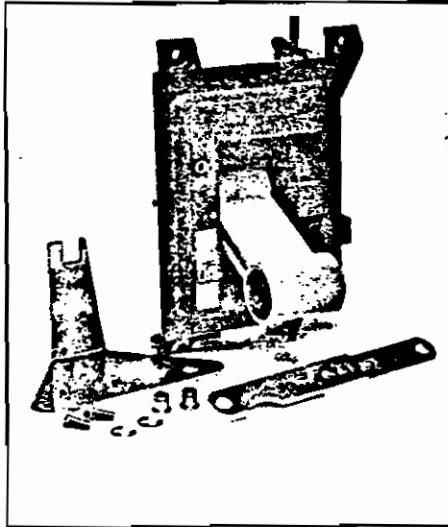
Renewal Parts Data Supplement

8991a

Page 25

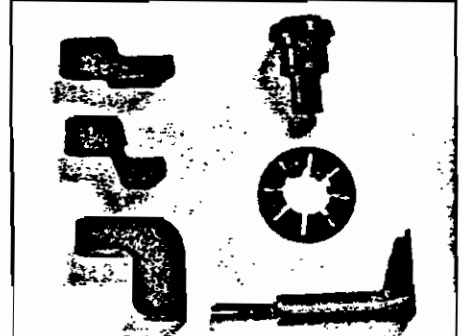
① Operating Handle Mechanism Kit

Kit includes operating arm, adjustable linkage, and mounting hardware.



Description	Style No.
Circuit Breaker Units:	
FB/MCP	4719A92G43
KB	4719A92G05
HFD/HMCP	4719A88G01
HJD/HKD	4719A89G01
LB	4719A92G06
MA/MC	4719A92G07
NB	4719A92G08
FCL	4719A92G44
LCL	4719A92G45
HFD/HMCP (6" unit)	4719A92G56
Fusible Switch Units:	
30/60/100A DS Switch	4719A92G09
200/400A DS Switch	4719A92G10

Overload Reset Button and Reset Rod Ext. Kit



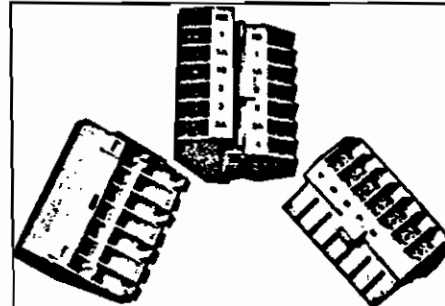
Description	Style No.
For Freedom starters, the kit includes reset button, retainer, and adaptor.	4719A92G58

② Unit Drawout Top Rail



Description	Style No.
Unit top rail with hardware	4719A92G02

③ Terminal Blocks

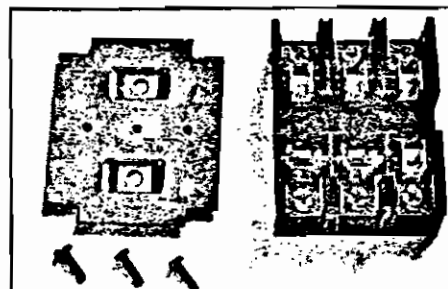


Description	Style No.
White, 7 circuit, pull-apart	4719A92G57

Control Transformers (480/240V to 120V single phase)

Description	Style No.
50VA	4719A92G46
100VA	4719A92G48
150VA	4719A92G49
200VA	4719A92G50
250VA	4719A92G51
300VA	4719A92G52
350VA	4719A92G53
500VA	4719A92G54

Primary/Secondary Fuse Holder Kit



Description	Style No.
Kit includes fuse block, mounting bracket and screws.	4719A92G59



Cutler-Hammer

**Westinghouse &
Cutler-Hammer Products**

Industrial Control Division
Milwaukee, Wisconsin, U.S.A. 53216

April, 1998
Printed in U.S.A.

EAT•N



Replacement Feeder Units

Renewal Parts Data

8991a

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Product Description

Each Feeder Unit consists of a single mounted 3 pole molded case circuit breaker or fusible switch (dual mounted are also available). Each unit includes a new wrapper, stab assembly, door, handle mechanism and customer specific disconnect device. They are shipped assembled and ready to install into the existing Motor Control Center.

The following are simple steps to select and order a new feeder unit:

Step 1: Select the circuit device required from the table to the right.

Step 2: Verify the amount of space available.

Step 3: Create a Catalog number from the formula below.

Unit options and modifications for replacement feeder units:

For factory installed molded case circuit breaker modifications or additional unit options, contact the factory for prices and availability.

How to Create a Catalog Number:

After selecting the circuit device required, create a Dual Mounted feeder unit catalog number based on the following:

Electrical Characteristics and Space Requirements of Molded Case Circuit Breakers and Fusible Switch Replacement Feeder Units

Device Type	Max Amps	Interrupting Rating (KAIC)			Trip Rating or Clip	F2100 Series 2100/5 Star ADVANTAGE		Freedom Unitrol		F10 Unitrol		Type W		9800 Unitrol		11-300	
		240V	480V	600V		Single	Dual	Single	Dual	Single	Dual	Single	Dual	Single	Dual	Single	Dual
HFD	150	100	65	25	15												
					20												
					25												
					30												
					40												
					50												
					60												
					70												
					80	6"●		6"●									
					90	12"●	12"	12"●	12"	12"●	12"	12"●	12"	14"	14"	14"	14"
HJD	250	100	65	25	100												
					125	12"	12"	12"	18"	12"	18"	12"	12"	14"	18"	14"	14"
					150	18"						18"					
					175												
HKD	400	100	65	35	200			24"		18"		18"		18"		14"	
					225	18"											
					250												
					300												
HLD	600	100	65	35	350												
					400	24"		24"●		24"●		24"		28"●		14"	
					500												
					600	24"											
Fusible Switch	30	100	100	100	30	12"	18"●	12"	18"	12"	18"	12"	18"●	14"	14"	14"	14"
	60	100	100	100	60	12"	18"●	12"	18"	18"	18"	12"	18"●	14"	18"	14"	14"
	100	100	100	100	100	18"		18"		18"●		18"●		18"		18"	
	200	100	100	100	200	36"		30"		30"		24"		28"		28"	
	400	100	100	100	400	36"		72"●		48"		42"				42"	
	600	100	100	100	600	48"●		72"●									

● 100A maximum.

● Cable in/cable out, no stab assembly.

● Combined ampacity no greater than 150A

for 12" height. For greater than 150A, 18" required.

● F10 and Type W available in 12" space.

● Available in 18" height.

FT

E

2

L

N

18

Type MCC

FZ = F2100

FK = ADVANTAGE

FS = Series 2100/5 Star

FD = Freedom Unitrol

FR = F10 Unitrol

FT = Type W

FN = 9800 Unitrol

FJ = 11-300

Device Type

F = HFD

J = HJD

K = HKD

Z = Switch

Type of Unit

1 = Single

2 = Dual

Trip or Clip Rating

A = 15

B = 20

C = 25

D = 30

E = 40

F = 50

G = 60

H = 70

J = 80

K = 90

L = 100

M = 125

N = 150

P = 175

Q = 200

R = 225

S = 250

T = 300

W = 350

X = 400

Y = 500

Z = 600

Trip or Clip Rating for Dual Mounted

(use table at left)

Unit Size

06 = 6"

12 = 12"

14 = 14"

18 = 18" or 18 2/3"

24 = 24"

28 = 28"

30 = 30"

36 = 36"

37 = 37 1/3"

48 = 48"

72 = 72"

Follow the example below for Single Mounted feeder unit.

FZ

E

1

L

12

Catalog number varies in length based on single or dual mounted unit.)

ENCLOSURE SPECIFICATIONS

Enclosure Type - NEMA 1 Indoor Gasketed

Depth - 21"

Configuration - Front Mounted Only

Horizontal Wireway - 9"Top-9"Bottom

Paint Finish - ANSI-61-Exterior White-Interior

ONE Coat(s) Exterior Paint Applied

Enclosures comply with UL845's "two meter rule" when the bottom of the MCC is at the same level as the operator's platform.

APPLICABLE DESIGN STANDARDS AND ELECTRICAL CODES:

NEC Article 430, Part H, Sections 92-98

NEMA Standard ICS 2-322

UL Standard UL845, File No. E47048

NAMEPLATE SPECIFICATIONS:

Master Nameplate Letter Size - 7/8"

Master Nameplate Color - Black with White letters

Master Nameplate Located in Structure - 1

Unit Nameplate Size - 1"-X-2.5"

Unit Nameplate Letter Size - 3/16"

Unit Nameplate Color - Black with White letters

Unit Nameplate Type - Engraved

Nameplates attached with - Stainless Steel Self Tapping Screws.

MASTER NAMEPLATE: Line-1 MCC

Line-2

Line-3

Line-4

Line-5

Line-6

Line-7

Prepared By: GARY HOLDER

Date: 05/18/99

MCC Title: MCC

Drawing Description: Enclosure Specifications

Cutler-Hammer
Fayetteville, North Carolina

G.O.: HUBU12339

Item: 001

Rev 1

Sheet 2 of 7

CUTLER-HAMMER
FREEDOM 2100
MOTOR CONTROL CENTER

Item: 001

Customer Shop Number: 023291 Item: 09

☐ Customer Approval ☒ Final as Built

[illegible]

X - Denotes Drawings included in this Transmittal

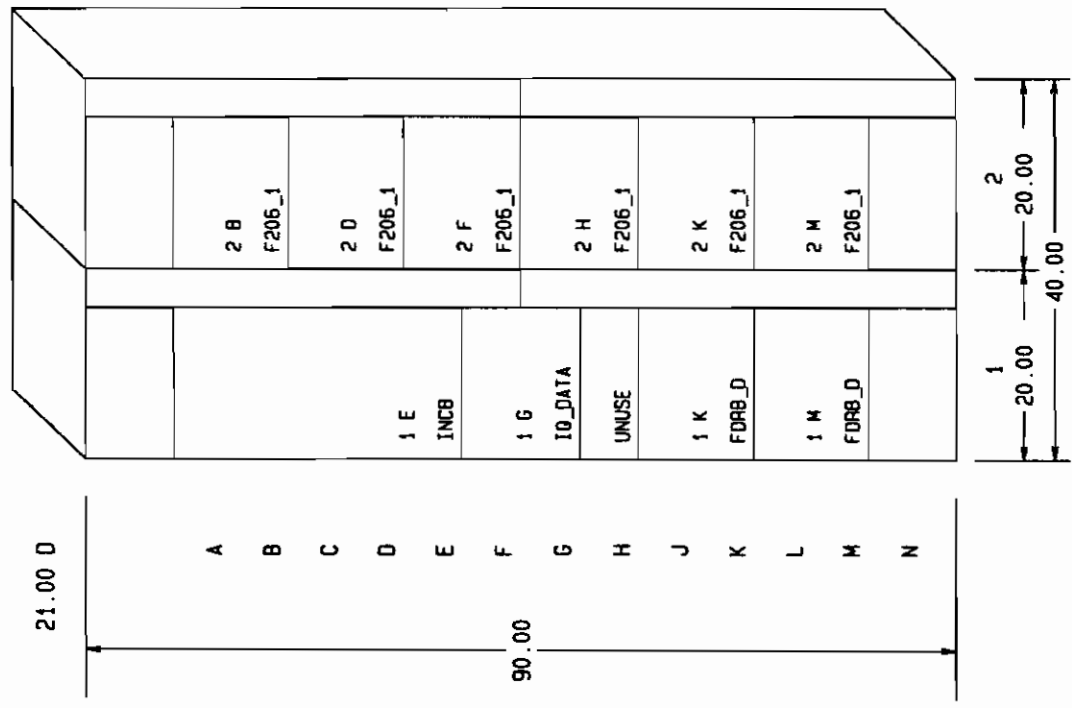
Date: 05/18/99

MCC Title: MCC
Drawing Description: Master Drawing Index

G.O.: HUBU12339

Rev 2

Sheet 1 of 7



CUTLER-HAMMER CORPORATION
MCC ASSEMBLY PLANT
FAYETTEVILLE NC

DATE 05/18/99
DATE

PREPARED BY GCH
APPROVED BY

PAGE NO.
FV - 1

GENERAL ORDER NO
HUBU12339 - 001

FREEDOM 2100 MCC
MCC FRONT VIEW

BUS SYSTEM SPECIFICATIONS

Horizontal Bus Rating - 600 AMP
 Horizontal Bus Material - Tin Plated Copper
 Bus Bracing - 65 K RMS Symetrical Withstand Rating
 Bus System Maximum Temperature Rise - 65 Degrees C

Vertical Bus Ratings:
 Vertical Bus - 600 A Vertical Section # 1
 Vertical Bus - 300 A Vertical Section # 2

Vertical Bus Material - Tin Plated Copper
 Vertical Bus Barrier - Red Flat Glass Polyester

Ground Bus Rating - 800 Amperes
 Ground Bus Material - Tin Plated Copper
 Ground Bus Location - TOP
 Ground Terminal Size - 2-#4-500MCM
 Ground Terminal Location - INC-LINE

Neutral Bus Rating - 300 Amperes
 Neutral Bus Material - Tin Plated Copper with heat shrink wrap insulation.
 Neutral Bus Location - BOTTOM
 Neutral Terminal Size - 1-#6-350MCM
 Neutral Terminal Location - INC-LINE

MCC G.O. NAMEPLATE

 HUBU12339T 001 FVC
 600 A
 480V 3PH 4W 60HZ
 SECT.1 600A
 SECT.2 300A

Prepared By: GARY HOLDER

Date: 05/18/99

MCC Title: MCC

Drawing Description: Bus System Specifications

Cutler-Hammer
 Fayetteville, North Carolina

G.O.: HUBU12339

Item: 001

Rev 1

Sheet 3 of 7

REVS							
Nameplate	Unit # Class Description Cust Unit #	Nema Size Mtr HP/KW Motor FLA Heaters CPT VA	Device Codes	Bkr /Switch Poles TM Trip /Clip MG Range/Fuse Disc. Aux Sw.	Total Intlk NO/NC	Wiring Diagram(s) Int-Rating	Unit Features
WET WELL "C" PUMP	2 H F206 1 FVNR	1 1.5 3.00 / H20088-3 150 VA CPT	D1 D2	HMCP 3 7 (21 - 70)	2NO/1NC	WD-1 65KA	U2
WET WELL "D" PUMP	2 K F206 1 FVNR	1 1.5 3.00 / H20088-3 150 VA CPT	D1 D2	HMCP 3 7 (21 - 70)	2NO/1NC	WD-1 65KA	U2
SPARE	2 M F206 1 FVNR	1 3.0 4.80 / H20098-3 150 VA CPT	D1 D2	HMCP 3 7 (21 - 70)	2NO/1NC	WD-1 65KA	U2
Prepared By: GARY HOLDER		Date: 05/18/99		MCC Title: MCC Drawing Description: Unit Listing			
Cutler-Hammer Fayetteville, North Carolina		G.O.: HUBU12339		Item: 001	Rev 1	Sheet 5 of 7	

REVS	2	REV. FOR MFG. 6/20/99 D. DAVIS					
Nameplate	Unit # Class Description Cust Unit #	Nema Size Mtr HP/KW Motor FLA Heaters CPT VA	Device Codes	Bkr /Switch Poles TM Trip /Clip MG Range/Fuse Disc. Aux Sw.	Total Intlk NO/NC	Wiring Diagram(s) Int-Rating	Unit Features
MAIN BREAKER	1 E INCB Main Ckt Bkr 1 - 1/0	 SCREW Type	Lugs/Phase.	HJD 3 150 Cable Entry - TOP		WD-MB 65KA	U1 Service Entrance
METERING SECTION	1 G IQ DATA Main Metering	 IQ-DATA				1A67136 WD-MB	
	1 H UNUSE						
FEEDER TO TVSS	1 KL FDRB D Feeder			HFD 3 20		5599A85 B 65KA	
EUH HEATER	1 KR FDRB D Feeder			HFD 3 15		5599A85 B 65KA	
FEEDER TO 7.5 KVA XFRMR (2 POLE)	1 ML FDRB D Feeder			HFD 3 30		5599A85 B 65KA	
SPARE	1 MR FDRB D Feeder			HFD 3 30		5599A85 B 65KA	
WET WELL "A" PUMP "A"	2 B F206 1 FVNR	1 1.5 3.00 / H2008B-3 150 VA CPT	D1 D2	HMCP 3 7 (21 - 70)	2NO/1NC	WD-1 65KA	U2
WET WELL "A" PUMP "B"	2 D F206 1 FVNR	1 1.5 3.00 / H2008B-3 150 VA CPT	D1 D2	HMCP 3 7 (21 - 70)	2NO/1NC	WD-1 65KA	U2
WET WELL "B" PUMP	2 F F206 1 FVNR	1 1.5 3.00 / H2008B-3 150 VA CPT	D1 D2	HMCP 3 7 (21 - 70)	2NO/1NC	WD-1 65KA	U2
Prepared By: GARY HOLDER		Date: 05/18/99		MCC Title: MCC Drawing Description: Unit Listing			
Cutler-Hammer Fayetteville, North Carolina		G.O.: HUBU12339		Item: 001	Rev 2	Sheet 4 of 7	

1Q DATA DIP SWITCH AND VOLTAGE BAR SETTINGS

SW1	
1 ON	CT Ratio
2 OFF	
3 OFF	
4 ON	
5 ON	
6 OFF	
7 OFF	
8 ON	50/60 HZ Selection

CT Ratios	SW1 Switch Settings				
	1	2	3	4	5
300:5	ON	OFF	OFF	ON	ON
400:5	OFF	OFF	OFF	ON	ON
500:5	ON	ON	ON	OFF	ON
600:5	OFF	ON	ON	OFF	ON
800:5	ON	OFF	ON	OFF	ON
1000:5	OFF	OFF	ON	OFF	ON
1200:5	ON	ON	OFF	OFF	ON
1500:5	OFF	ON	OFF	OFF	ON
1600:5	ON	OFF	OFF	OFF	ON
2000:5	OFF	OFF	OFF	OFF	ON
2500:5	ON	ON	ON	ON	OFF
3000:5	OFF	ON	ON	ON	OFF

SW2	
1 ON	PT Ratio
2 ON	
3 ON	
4 ON	
5 OFF	
6 OFF	
7 OFF	
8 OFF	3 Wire / 4 Wire System

PT Ratios	SW2 Switch Settings			
	1	2	3	4
1:1	ON	ON	ON	ON
2:1	OFF	ON	ON	ON
4:1	ON	OFF	ON	ON
5:1	OFF	OFF	ON	ON
20:1	ON	ON	OFF	ON
30:1	OFF	ON	OFF	ON
35:1	ON	OFF	OFF	ON
40:1	OFF	OFF	OFF	ON
55:1	ON	ON	ON	OFF
60:1	OFF	ON	ON	OFF
70:1	ON	OFF	ON	OFF
100:1	OFF	OFF	ON	OFF
120:1	ON	ON	OFF	OFF

Voltage Selector Bar Setting

If Service Voltage is:	Set Voltage Bar at:
425 to 680 VAC	460/575V
270 to 432 VAC	380/416V
170 to 272 VAC	208/220/240V
96 to 154 VAC	120V

VOLTAGE SELECTOR SETTING: 460/575V

Unit Reference: 1 G

NOTE: REFER TO TECHNICAL MANUAL TD-17283 FOR DETAILS OF DIP SWITCH SETTINGS.

Prepared By: GARY HOLDER

Date: 05/18/99

MCC Title: MCC

Drawing Description: 1Q Data DIP Switch Settings

Cutler-Hammer
Fayetteville, North Carolina

G.O.: HUBU12339

Item: 001

Rev 2

Sheet 7 of 7

SYSTEM AND UNIT SPECIFICATIONS

Service Voltage: 480V 3 Phase 60 Hz 4 Wire
Control Voltage: 120V
Control Voltage Source: Individual Control Power Transformer
NEMA Class/Type Wiring - 1B

Motor Overload Protection:

Overload protection is class 20 with heater packs supplied.

Starter Terminal Blocks to be LATCHED 7ckt Pull Apart

Starter Unit Wiring Features:

All Control Wire to be 16awg red PVC
All Power Wire to be Black TEW

Customer Load Terminal Type: Standard Device Lugs
Wiremarkers for Control Wiring to be Non-Shrink-On At Each End.
Wiremarkers for Power Wiring to be Non-Shrink-On At Each End.

**** Device code LEGEND ****

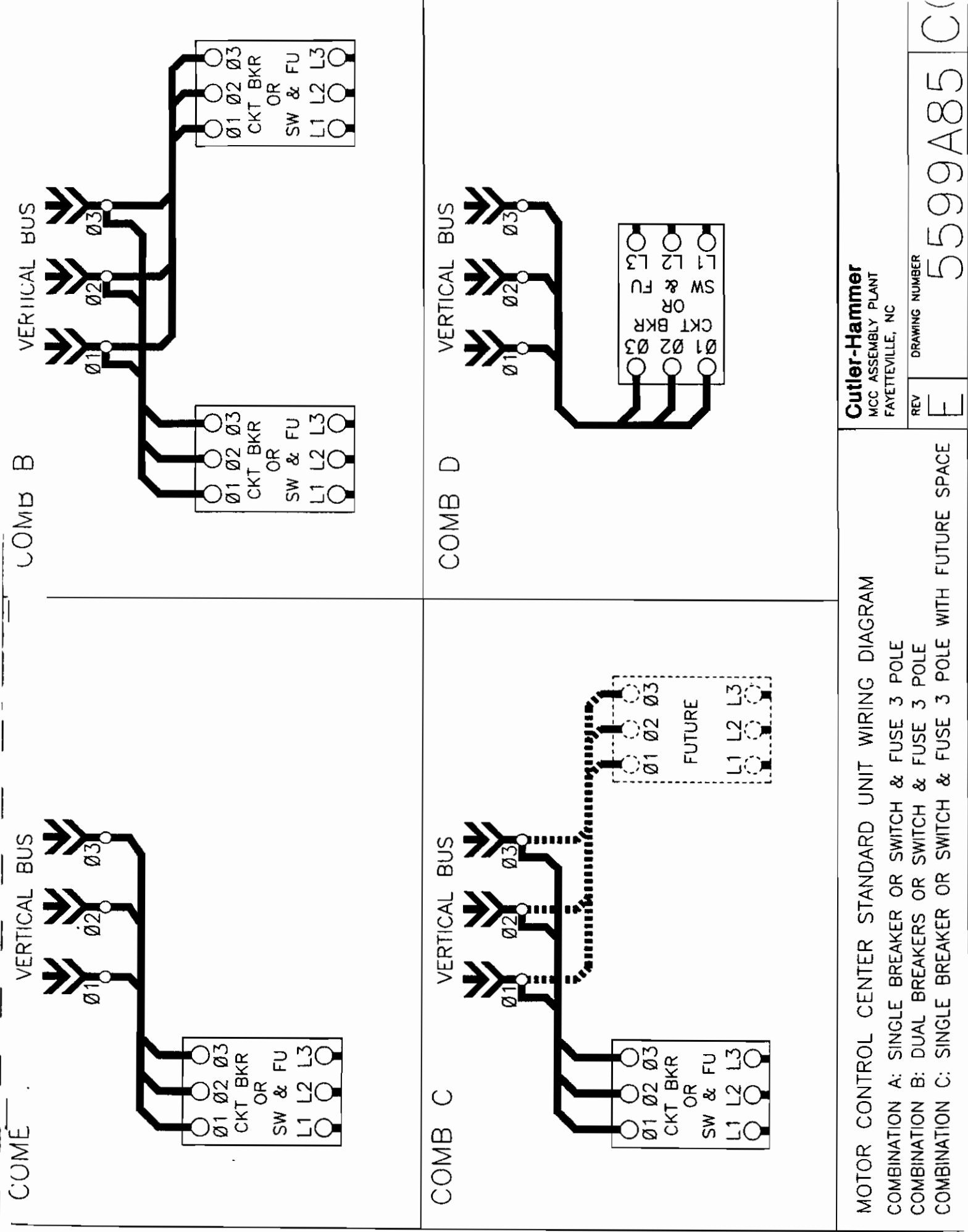
D1 Selector Switch : Three-Position : Hand-Off-Auto
D2 Indicating Light : Transformer : Red : Run

**** Unit features LEGEND ***

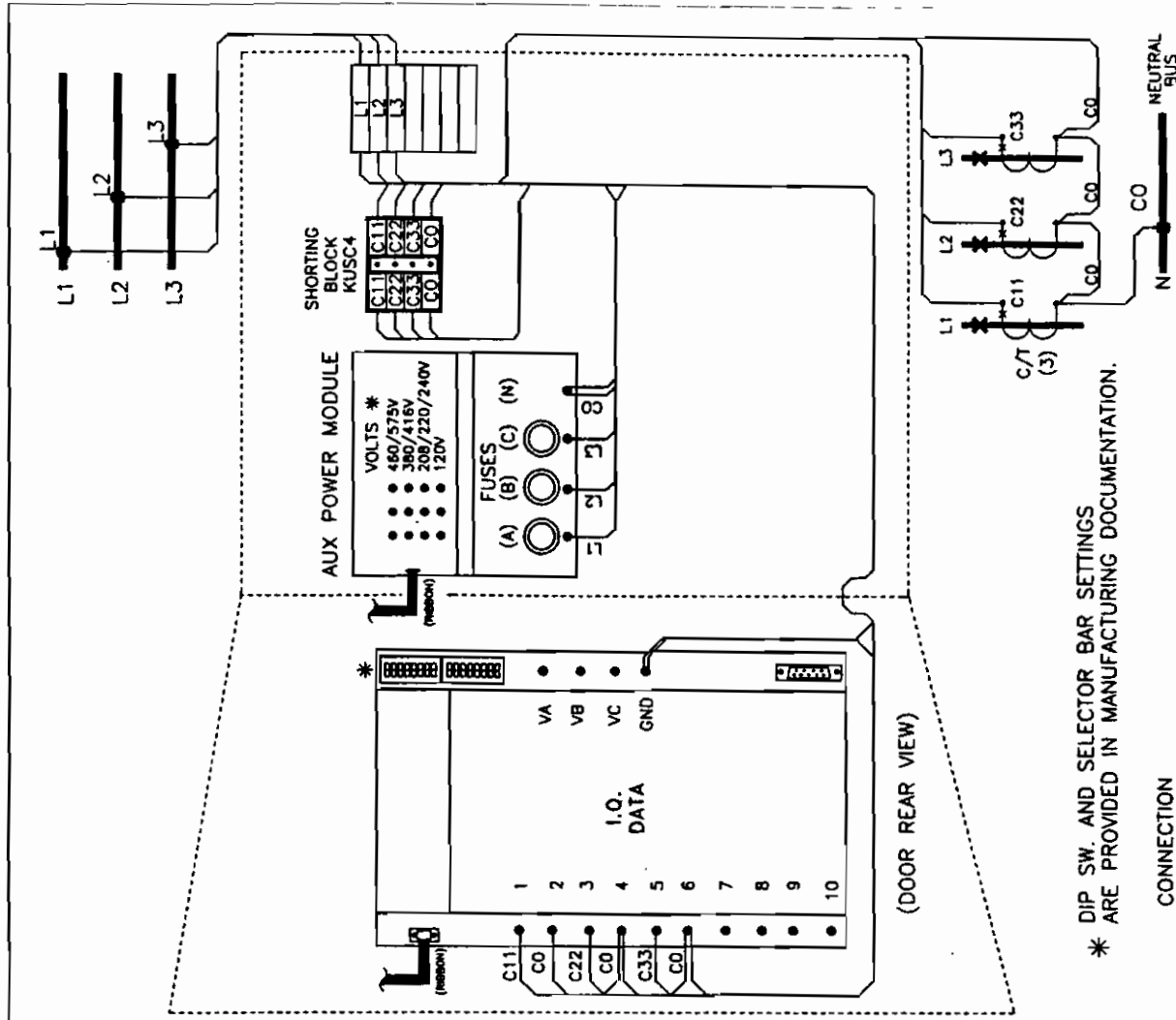
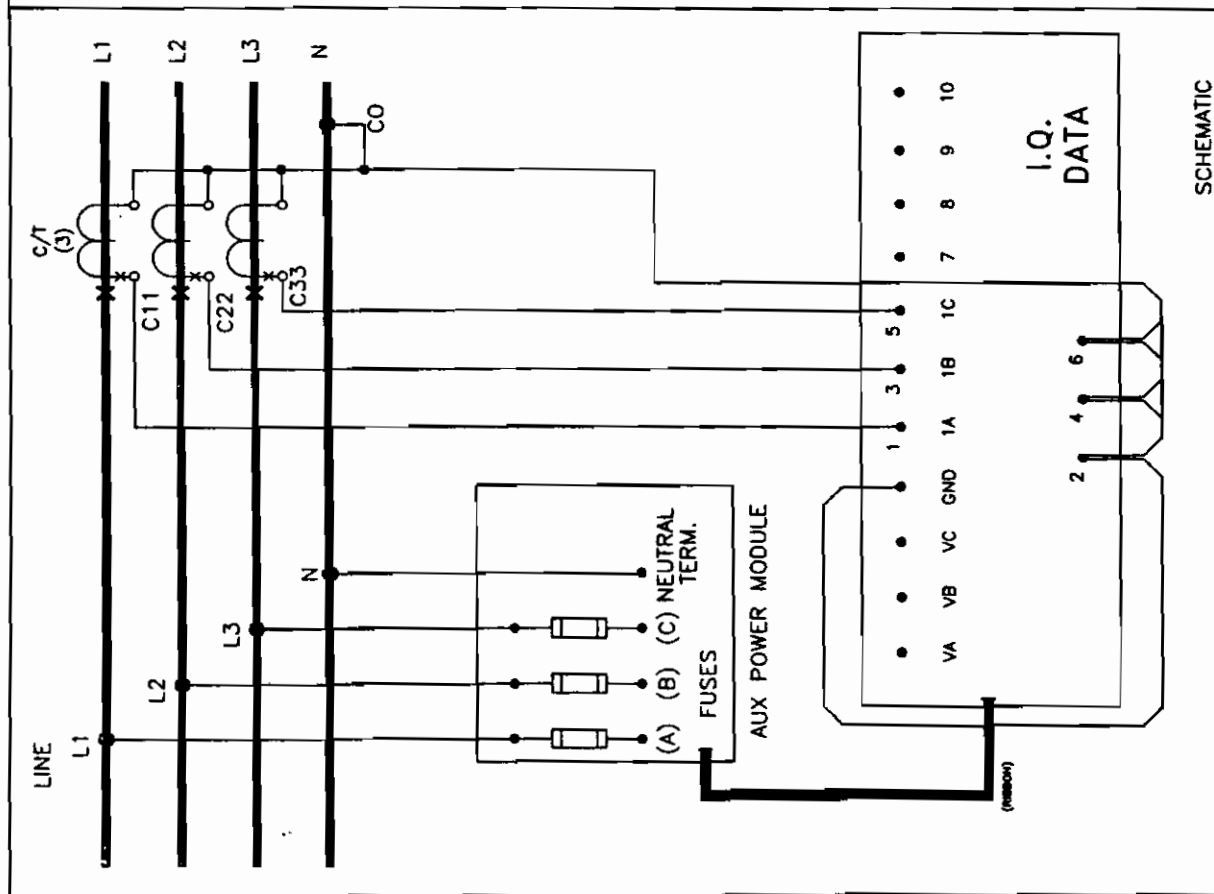
U1 Unit to contain 300:5 ratio current transformer. : Qty : 3
U2 3-POS SEL SWITCH WITH SPRING RETURN FROM HAND TO OFF : Qty : 1

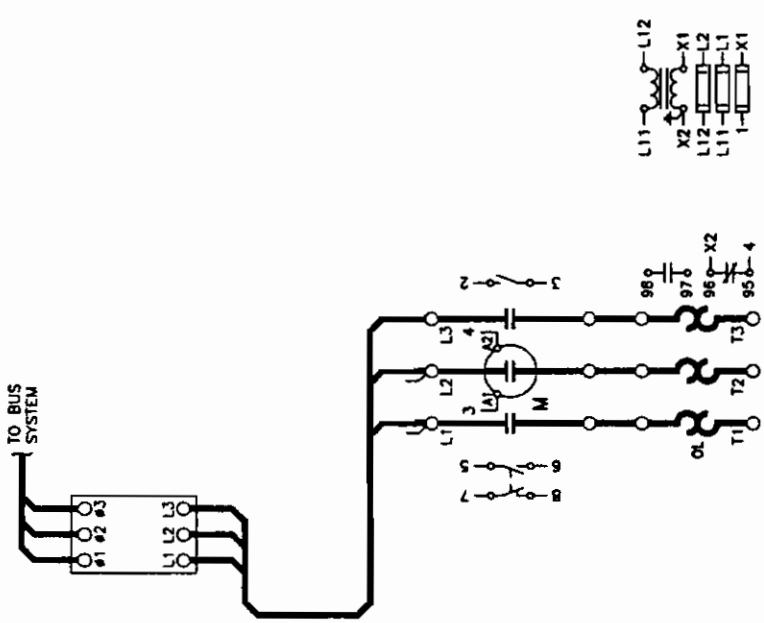
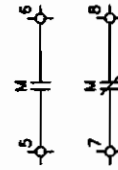
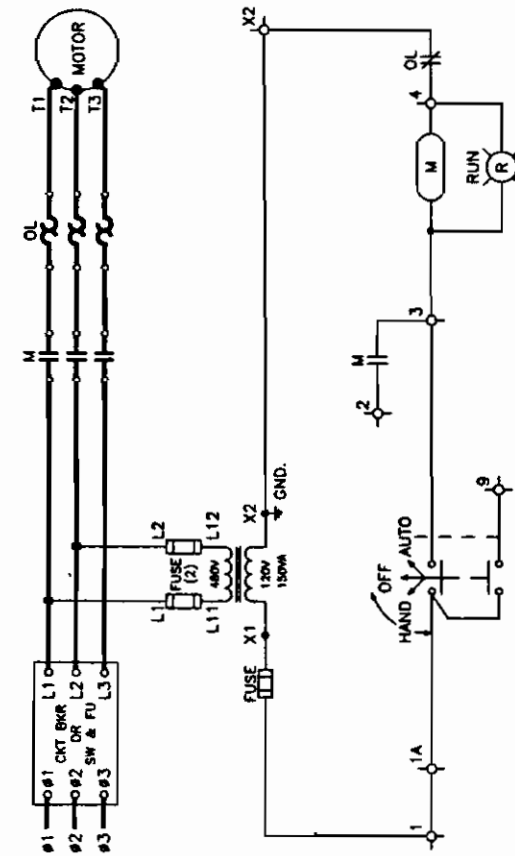
NOTE
300:5 CTS CHANGED TO 150:5 BY CUTLER HAMMER
SERVICE ENGINEER ON FEB. 7, 2000.

Prepared By: GARY HOLDER	Date: 05/18/99	MCC Title: MCC Drawing Description: Unit Specification and Features			
Cutler-Hammer Fayetteville, North Carolina		G.O.: HUBU12339	Item: 001	Rev 1	Sheet 6 of 7

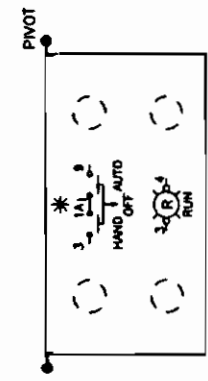


MOTOR CONTROL CENTER STANDARD UNIT WIRING DIAGRAM		Cutler-Hammer MCC ASSEMBLY PLANT FAYETTEVILLE, NC	
COMBINATION A: SINGLE BREAKER OR SWITCH & FUSE 3 POLE		REV	DRAWING NUMBER
COMBINATION B: DUAL BREAKERS OR SWITCH & FUSE 3 POLE		E	5599A85
COMBINATION C: SINGLE BREAKER OR SWITCH & FUSE 3 POLE WITH FUTURE SPACE		C	





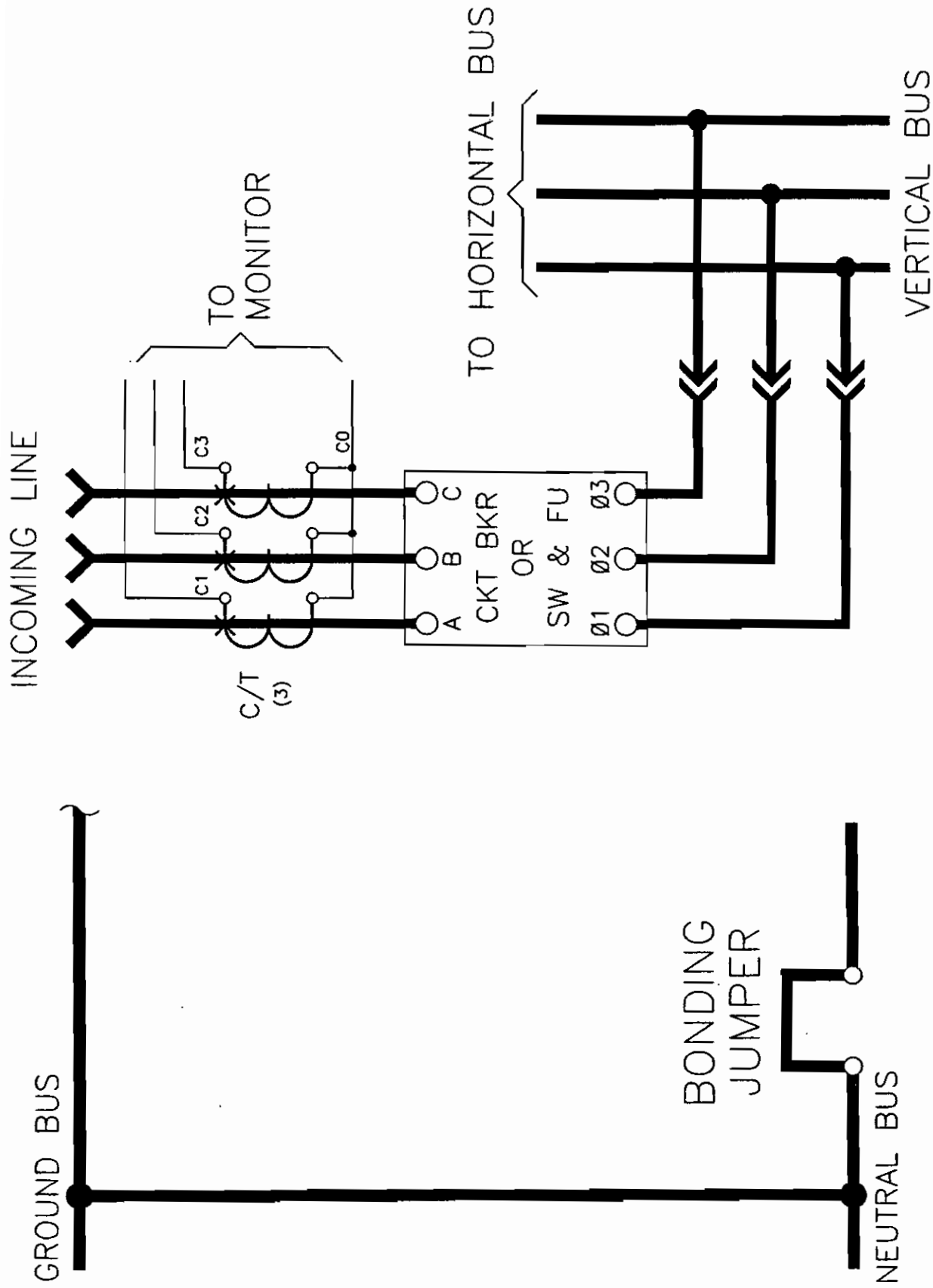
* - SPRING RETURN FROM LEFT TO CENTER.



SCHEMATIC

CONNECTION

1		REVISION		REVISED FOR 2		MANUFACTURE. 6/20/99 O. DAVIS			
		THE INFORMATION ON THIS DOCUMENT IS CREATED BY CUTLER-HAMMER. IT IS DISCLOSED IN CONFIDENCE AND IS ONLY TO BE USED FOR THE PURPOSE IN WHICH IT IS SUPPLIED		DTR Gary C. Holder		DATE 5/18/99		Cutler-Hammer FAYETTEVILLE, N	
				APPD		DATE		TITLE WIRING DIAGRAM - F206 SIZE 1 FVN	
				APPD		DATE		TYPE FREEDOM 2100	
				REVISION 1		DWG SIZE A		C.O. HUBU12339	
		FEDERAL ID NO		PRODUCT CODE A4E2				DWG WD-1	
								SHEET 1 of 1	



1		REVISION		REVISED FOR		MANUFACTURE.		/20/99		DAVIS	
2											
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FEDERAL ID NO		PRODUCT CODE									
A4E2		A									
REVISION		1		DWG SIZE							
G.O.		HUBU12339		DWG		WD-MB		SHEET 1 OF 1			
TYPE		FREEDOM 2100		CONNECTION							
TITLE		WIRING DIAGRAM - MAIN BREAKER									
DATE		5/18/99									
DTR		Gary C. Holder		DATE							
APPD				DATE							
APPD				DATE							
CUTLER-HAMMER		FAYETTEVILLE, NC									

SECTION E3
MCC SURGE PROTECTION

Surge FreeTM

SF160M

Standard Class Entry Protector

$I_p = 160kA$

The SF160M Series offers first-rate protection for most applications at the main service panel. Computers, sensitive business systems and other high tech equipment are guarded from damage, errors and downtime that result from high speed transients and surges.

The SF160M is a shunt-installed device designed to protect your facility from damaging surges at the service entrance panel. The SF160M's Micro-Z circuitry significantly reduces the surge remnant voltage or "let-through" experienced by the protected equipment (see pages 10-12). A special wiring configuration offered by MCG features accommodations for neutral conductors. This allows for significantly less impedance than is found in standard connective practices.

The SF160M works by diverting excess transient currents away from the sensitive equipment whenever the surge exceeds the specified clamping threshold.

The UL-listed SF160M automatically resets after the transient has been diverted. It is housed in a rugged, indoor/outdoor NEMA 4 enclosure.



ANSI/IEEE
Category C

Features of the SF160M

☒ Protection Redundancy

Each phase employs independently-fused protection elements within a module to provide back-up protection for continued equipment survival despite a fault condition.

☒ Micro-Z Concept / MOV Technology

MCG's patented Micro-Z technology system significantly reduces let-through voltage across the board and connecting cabling. 40mm MOV's.

☒ Personnel Safety

Integral disconnect with Lexan deadfront.

☒ Ten Year Warranty

And free replacement modules and fuses for life.

☒ Self Diagnostics & Self Test

Both front panel and internal LEDs offer continuous analysis of power and possible fault conditions. Self test ensures integrity of diagnostic components.

☒ Audible Alarm & Remote Alarm

Reduced protection triggers an audible alarm with mute capability. Monitor unit from a remote location using Form C dry contacts.

☒ Transient Event Counter

Records the number of surges suppressed and is resettable.

☒ Sinewave Filtering

MIL STD 220A. No charge option.

MCG Surge Protection

1-800-851-1508

<http://www.mcgsurge.com>

12 Burt Drive, Deer Park, N.Y. 11729, U.S.A. ♦ Phone (516) 586-5125 ♦ Fax (516) 586-5120 ♦ Note: New (631) Area Code begins 11/1/99 ♦ E-Mail: mcginfo@mcgsurge.com

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Free Replacement Modules

Above and beyond our 10 year no-nonsense warranty, MCG offers free replacement of protection modules and fuses for all applicable AC power line protectors. Just call MCG if a module gets damaged and we'll SHIP it to you immediately from inventory.

See Us on the Web!!
We update daily.
<http://www.mcgsurge.com>
or email us at:
mcginfo@mcgsurge.com

1-800-851-1508

<http://www.mcgsurge.com>

MCG Surge Protection

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SF160M Electrical Specifications

The SF160M Series of surge protectors meet or exceed ANSI/IEEE C62.41-1991 and UL 1449, 2nd Ed.

Model	Rated Voltage	Description	Energy Absorption (8/20μs) Joules Total	Typical Peak Suppression Voltage 6" Lead Length (8/20μs)		UL1449 Surge Voltage (8/20μs)
				10kA	3kA	
SF160M-120T	120/240VAC	1φ, 3w+gnd	8,722	520V	400V	400V
SF160M-120Y	120/208	3φ, 4w+gnd wye	8,722	520	400	400
SF160M-220Y	220/380	3φ, 4w+gnd, wye	23,520	840	740	700
SF160M-240Y	240/415	3φ, 4w+gnd, wye	23,520	840	740	700
SF160M-240D	240	3φ, 3w+gnd, delta	20,160	840	820	700
SF160M-240DCT	240/120/120*	3φ, 4w+gnd, hi-leg	15,064	840/520	740/400	700/400
SF160M-277Y	277/480	3φ, 4w+gnd, wye	25,200	960	800	800
SF160M-480D	480	3φ, 3w+gnd, delta	36,000	-	1536	1500

* High-leg delta center tapped

Maximum Continuous Operating VAC: 115% rated line voltage

Response time: <5 nanoseconds

Modes of protection: L-N, L-G, L-L, N-G
(where applicable)

Surge current/phase (8/20μs) 1 event: 160kA

Surge life/phase (8/20μs) 10,000 impulses: 6kA

Filter attenuation MIL STD 220A (50 ohm):	120VAC	240VAC	277VAC	480VAC
-30db	100kHz	25kHz	80kHz	80kHz
-40db	200kHz	100kHz	180kHz	180kHz
-50db	280kHz	180kHz	210kHz	250kHz
-55db	310kHz	200kHz	390kHz	390kHz

Protection present indicators: Green LED

Reduced protection indicator: Red LED

Additional status indicators: Audible alarm, event counter,
remote alarm, dry contacts

Operating altitude: 13,000 ft. (4000m)

Temperature (operating): -40° to +70°C

Enclosure: NEMA 4, 14 gauge steel

Optional enclosures available

Dimensions: 12" x 10" x 5"

Mounting: 12.75" x 8"/.3125" ID - 4 holes

Connection: Terminals

Shipping weight: 23 lbs.

Shown here is a typical clamp waveform: SF160M-120Y suppression voltage is 520V; peak at 10kA (8/20).

Typical filter attenuation for SF160M-120YF -50db at 280kHz.

Ordering Information

Example: SF160M-120Y = 120/208 VAC, 3φ, 4w+gnd, wye.

No charge filter optional = SF160M-120YF.

Integral disconnect not available in delta.

MCG Surge Protection

1-800-851-1508

<http://www.mcgsurge.com>

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4 Wiring.

For Wye and High Leg Delta Models:

- Remove four thumb screws from deadfront.
- Pull handle to remove switch assembly.
- Lift insulating barrier to gain access to terminal blocks.
- Use the supplied Micro-Z connection cable. Cut the cable back as short as possible and make secure low resistance connections. Refer to the wiring diagram that matches the service panel circuit configuration identified in Step 1.
- The ground terminal is common to the protector chassis.
- Reinstall barrier.

For Delta models:

- Integral disconnect not available for Delta models.
- Use #8-14 AWG 600V insulated stranded copper wire, one wire connection per terminal. Refer to Fig. 4. Ensure secure low resistance connection. If using Micro-Z cable, leave the white wires unconnected and taped off. Cut the cable back as short as possible and make secure low resistance connections.
- Conductors should be tightly taped together for the entire run including wire within conduit to reduce wiring inductance. Wire length between protector and breaker panel should be as short as possible for best protection.
- A circuit breaker coordinated to wire size on each phase is recommended to feed the unit. The primary function of this breaker is to provide a means of removing power from the unit for maintenance. The circuit breakers will not trip during normal surge suppression since the response time of the circuit breaker is much longer than the duration of a transient voltage.
- If space for breakers is not available, use disconnect switch (customer supplied).

FIGURE 1

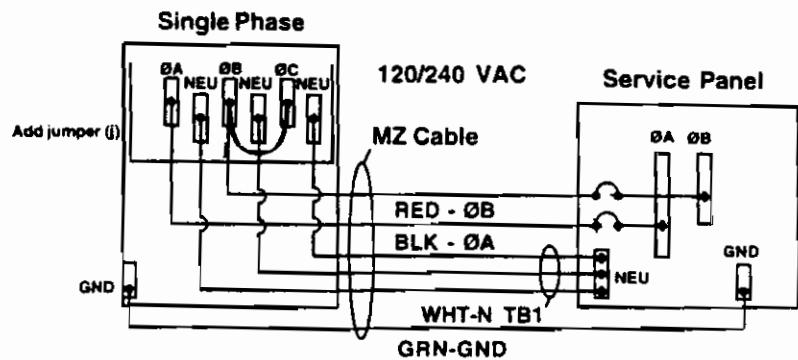


FIGURE 2

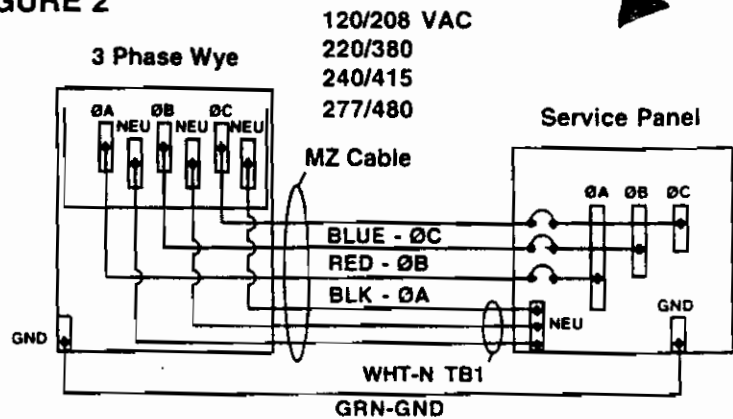


FIGURE 3

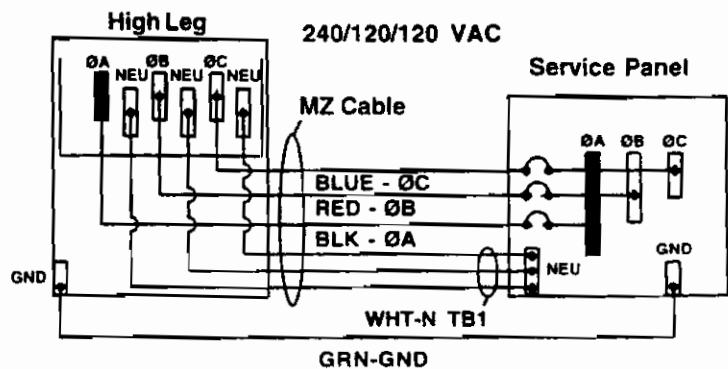
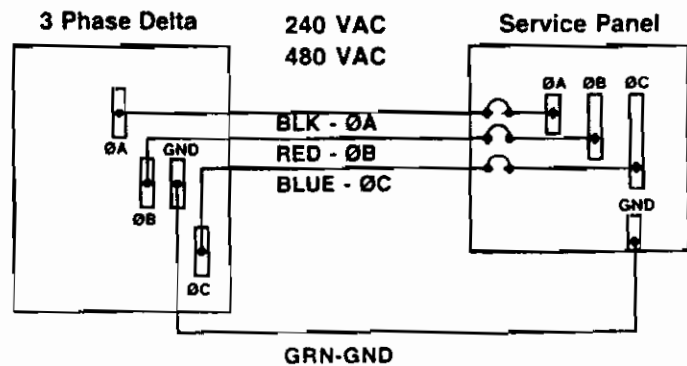


FIGURE 4



4A. Wiring Diagrams.

FIGURE 1 SINGLE PHASE

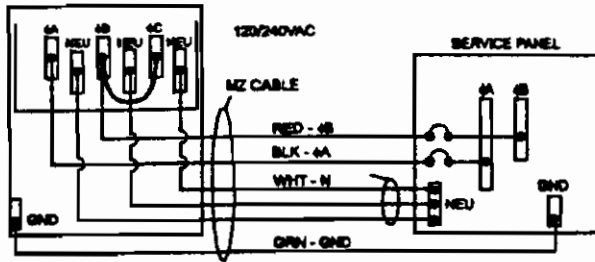


FIGURE 3 HIGH LEG

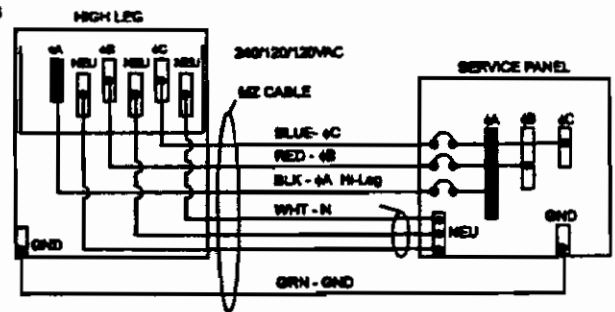
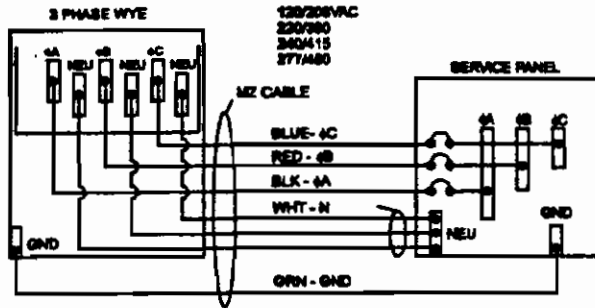


FIGURE 2 3 PHASE WYE



Troubleshooting

When the red "Protection Reduced" light is lit...

- Open door.
- Locate red lights indicating modules and fuses needing to be replaced.
- Remove four thumb screws from deadfront.
- Pull handle to remove switch assembly.
- **CAUTION** - After switch assembly is removed, power still exists at terminals below barrier.
- Front panel lights will extinguish.
- Replace appropriate modules and fuses.
- Reinstall switch assembly and thumb screws.
- Close and secure door.
- Green light on, red light off, full protection restored.
- Consult factory for assistance: 1-800-851-1508.

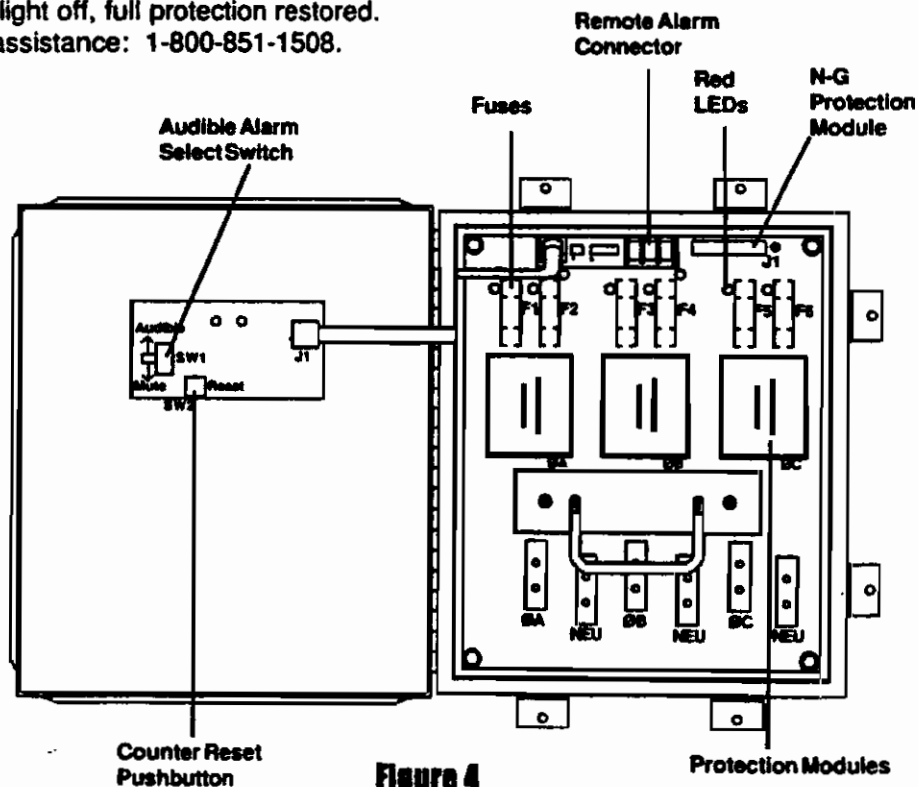


Figure 4

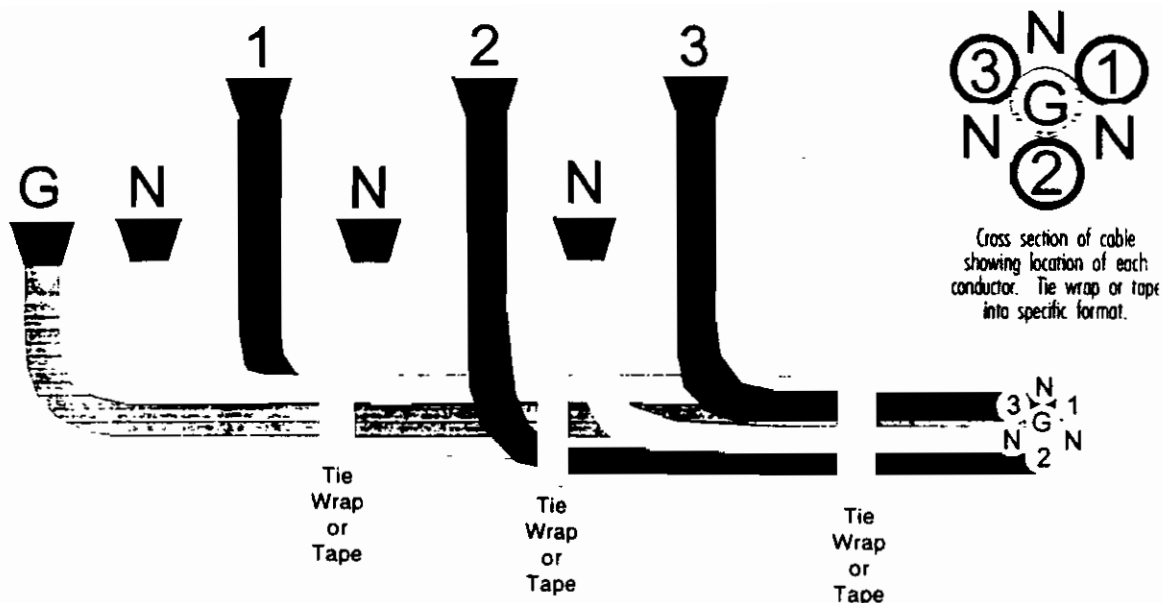


Figure 5

Dress out wires so a phase conductor is adjacent to the ground and the two neutrals for the length of the cable run which should be as short and straight as possible.

5 Install modules and fuses as in Figure 6.

Install L-N protection modules at each phase connection. **IMPORTANT** - On models with DCT suffix, install the 240V (Hi-Leg) module in the phase 1 location. Select audible or mute alarm.

Reinstall switch assembly and thumb screws on ID units.

6 Close door. Restore power.

To prevent possible electrical hazard, door on protector **MUST** be closed before restoring power.

Troubleshooting

When the red "**Protection Reduced**" light is lit...

- Open door.
- Locate red lights indicating modules and fuses needing to be replaced.
- Remove four thumb screws from deadfront.
- Pull handle to remove switch assembly.
- * **CAUTION** - After switch assembly is removed, power still exists at terminals below barrier.
- Front panel lights will extinguish.
- Replace appropriate modules and fuses.
- Reinstall switch assembly and thumb screws.
- Close and secure door.
- Green light on, red light off, full protection restored.

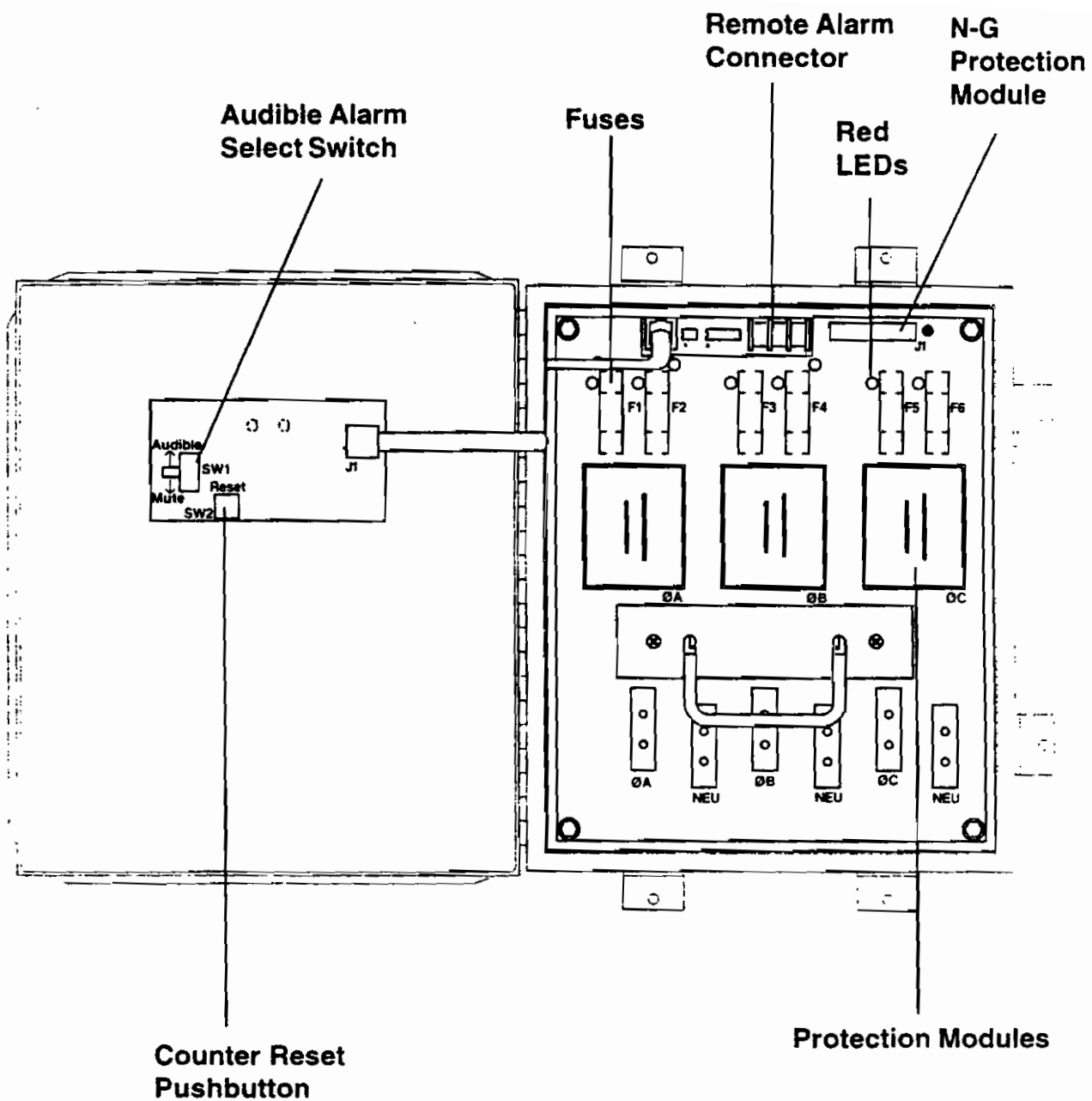


Figure 6

Good Morning,

Here is a list of MCG Representatives and Distributors. Please feel free to contact them or the factory directly with any questions you have on MCG products. Thank You.

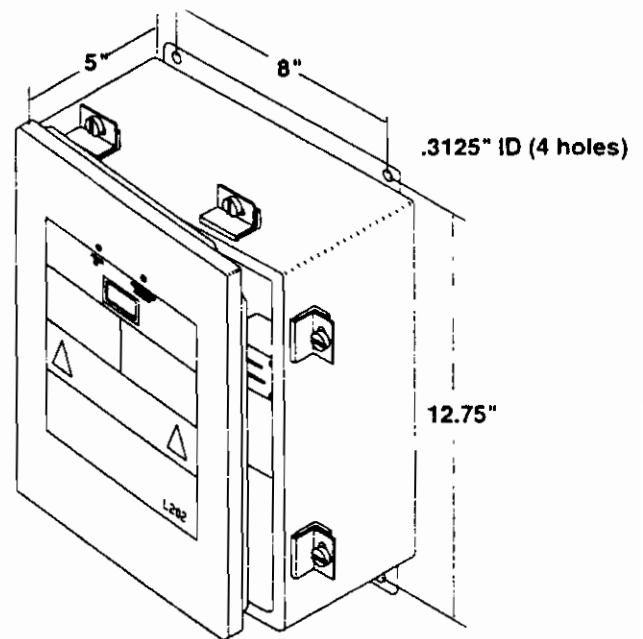
Representative List

State	Zip Codes	Rep. Name	Phone Number
Alabama	350-369	Gene Ruth Read Vaughn	561-567-2233 770-971-5451
Arizona	All	Randy Strange	602-938-7595
California, South	900-935	Jack McGruder	310-215-0800
Colorado	800-816	David Mazzocco	303-460-9394
Connecticut	All	Jim Tighe	781-229-6686
Delaware	197-198	Jim Nemec	609-985-8509
Florida	All	Gene Ruth Read Vaughn	561-567-2233 770-971-5451
Georgia	All	Gene Ruth Read Vaughn	561-567-2233 770-971-5451
Illinois, Southern	620, 622, 624, 628, 629	Bo Bickley	314-275-8666
Illinois, Northern	600-606, 609-616, 623 625-627	Dick Carzoli	847-516-9210
Indiana, NW	460, 462-466, 469, 479	Dick Carzoli	847-516-9210
Iowa	500-504, 504-516	Ken Frederick, Jr.	319-395-0028
Iowa	520, 521, 527, 528	Dick Carzoli	847-516-9210
Kansas	641, 661-679	Matt Pansing	316-683-8100
New York	100-119	Paul Moraff	516-667-8800
Maine	All	Jim Tighe	781-229-6686
Maryland	206-212, 214-219	Wayne W. Breslin, Jr.	410-744-9400
Massachusetts	All	Jim Tighe	781-229-6686
Michigan, (Detroit) Lower	480-483	Jim Maddex	937-324-3221 Toll Free: 888-777-0297
Missouri	630-631, 633-641, 644-648, 650-658	Bo Bickley (Eastern) Matt Pansing (Western)	314-275-8666 316-683-8100
Nebraska	680-693	Ken Frederick, Jr.	319-395-0028
Nevada, South	889, 890-891	Jack McGruder	310-215-0800
New Hampshire	All	Jim Tighe	781-229-6686
New Jersey	077-080-087	Jim Nemec	609-985-8509

Mounting Specifications

NEMA 4 Enclosure

FIGURE 7



Remote Alarm Wiring Option*

*NOT USED
@ NCR SITE.*

When desired, a 3-wire remote monitoring cable can be connected to the remote alarm relay connector located within the enclosure. The relay deactivates when any section of the surge suppression modules requires replacement or when power is removed from the suppressor. This can also be used as a power failure alarm.

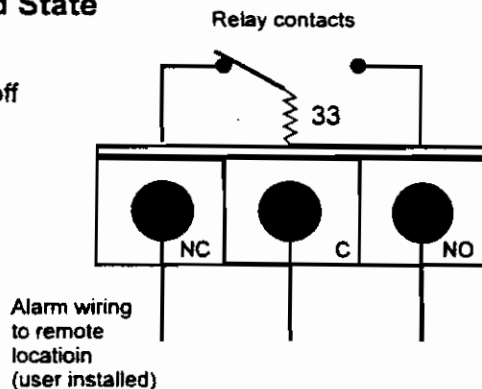
The center terminal is common. The outer two terminals provide a normally closed or normally open contact (when deactivated). The relay is activated during normal operation. SAO's provide surge protection for alarm wiring.

Do not exceed alarm relay contact ratings: Maximum load 60 ma.

Max. switching voltage 100VDC or 130VAC

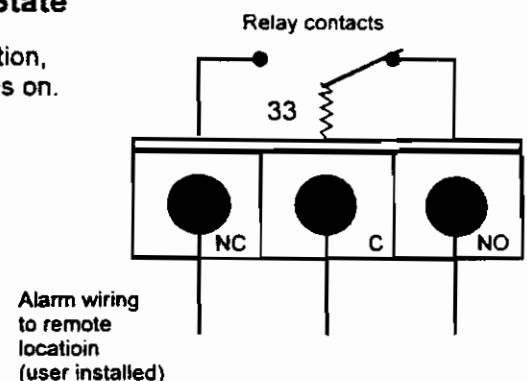
Deactivated State

Unit failure or
power to unit off
(power failure)



Activated State

Normal operation,
power to unit is on.



* Delta Power Configurations employ an Opto-Isolator. Consult factory for details.

DATA POWER SYSTEMS
Generators & Control Systems
Surge & Lightning Protection
UPS, Power Protection & Conditioning

4 HAYNES AVENUE
WEST ISLIP, NY 11795
TEL. (631) 667-8800
FAX (631) 243-1440

4 Pages

January 17, 2000

TO: CRA Services
ATTN: Larry G.
FROM: Paul Moraff
RE: MCG Surge Protection

AUTO DIALER
PHONE LINE
SURGE PROTECTION

Dear Larry:

Please see attached information on the MCG Model 4.2

This unit was replaced with the Model 4.71 which protects four wires (the 4.2 protected two wires).

Price for the 4.71 is \$80 each plus freight & tax.

Best regards,



Paul L. Moraff
Representative

NOTE

P.S.

There is no maintenance to be performed on the Model 4.2 (There is no indicator light).

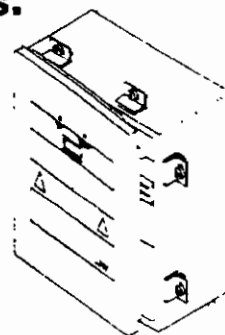
If the unit absorbs a surge large enough to cause it to fail, it will fail as an open circuit & the phone will not work until the unit is replaced (or bypassed).

Models MZB-ID and MZC-ID

Integral disconnect not available for Delta models.

Installation Instructions

Six Step Procedure:



1 Confirm Model with Power Service.

Measure ϕ -N, ϕ - ϕ with voltmeter to confirm application voltage prior to installation.

Model	Power Service	Description	Fig.
MZB-120T-ID	120/240 V	1 ph, 3w + g	1
MZB-120Y-ID	120/208 V	3 ph, 4w + g, wye	2
MZB-220Y-ID	220/380 V	3 ph, 4w + g, wye	2
MZB-240Y-ID	240/415 V	3 ph, 4w + g, wye	2
MZB-277Y-ID	277/480 V	3 ph, 4w + g, wye	2
MZB-240DCT-ID	240/120/120 V	3 ph, 4w + g, hi-leg delta	3
MZB-240D	240 V	3 ph, 3w + g, delta	4
MZB-480D	480 V	3 ph, 3w + g, delta	4
MZC-120T-ID	120/240 V	1 ph, 3w + g	1
MZC-120Y-ID	120/208 V	3 ph, 4w + g, wye	2
MZC-220Y-ID	220/380 V	3 ph, 4w + g, wye	2
MZC-240Y-ID	240/415 V	3 ph, 4w + g, wye	2
MZC-277Y-ID	277/480 V	3 ph, 4w + g, wye	2
MZC-240DCT-ID	240/120/120 V	3 ph, 4w + g, hi-leg delta	3
MZC-240D	240 V	3 ph, 3w + g, delta	4
MZC-480D	480 V	3 ph, 3w + g, delta	4

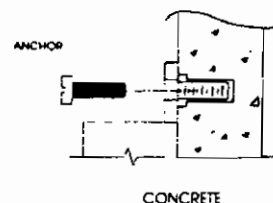
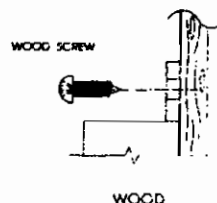
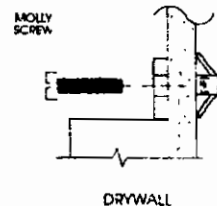
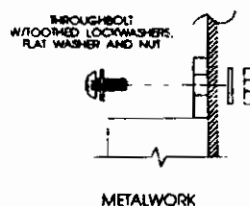
2 Disconnect power before installation.

All wiring to be done in accordance with National Electric Code and local codes by qualified electricians.

3 Mounting and wiring.

For best performance, mount protector as close to service panel as possible, not to exceed 2 feet.

Secure unit to mounting surface. (See pg. 4)
Use proper fasteners as indicated.
(Fasteners not supplied.)

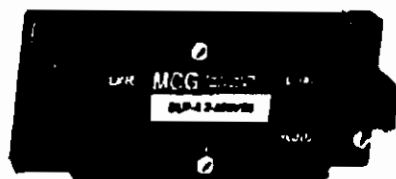


**MCG SURGE
PROTECTION**

1-800-851-1508



Modem/Fax/Telephone Protection



DLP-4.2/4.4



DLP-4.3



DLP-4.6/4.8

RJ11/45 Protectors

Protect modems, facsimile machines, and telephone lines from damaging transients caused by lightning and switching surges. The protector installs in minutes between the telephone line and the sensitive equipment, thus providing a quick retrofit for existing equipment or new installations.

The DLP-4.2 and 4.4 are designed to protect dial-up and leased lines at the sensitive equipment. The DLP-4.3 protects PC's and stand-alone equipment by providing telephone dial-up line protection that is referenced to the local AC outlet ground pin.

The DLP-4.6 and 4.8 are designed to protect at the terminal itself, in series with the telephone equipment.

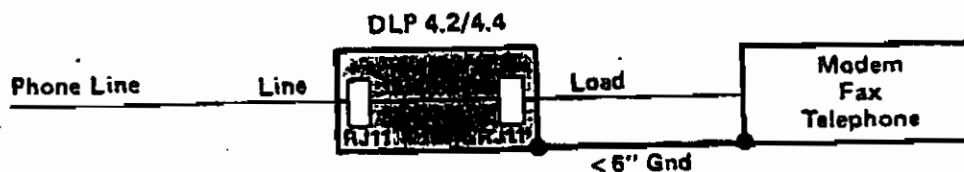
General Specifications

Clamping voltage	See Chart Below
Response time	< 1 nanosecond
Data Rate	56Kb
Operating temp.	-55° to +85°C

MODEL	CONNECTORS	PROTECTED SIGNAL LINES	GROUND REFERENCE	SIZE Page 14	CLAMP THRESHOLD (1ms)	CLAMP VOLTAGE (10/1000us)
DLP-4.2-200V15	RJ11	3, 4	Ground post (provided)*	Fig 3	+/-200V	+/-260V
DLP-4.3F-200V15	RJ11	3, 4	5-15P ground pin	Fig 4	+/-200V	+/-260V
DLP-4.4-6V15	RJ11	2, 3, 4, 5	Ground post (provided)*	Fig 3	+/-6V	+/-11V
DLP-4.6-200V	RJ11	1, 2, 3, 4, 5, 6	Braided lug*	Fig 5	+/-200V	+/-260V
DLP-4.8-200V	RJ45	1, 2, 3, 4, 5, 6, 7, 8	Braided lug*	Fig 5	+/-200V	+/-260V

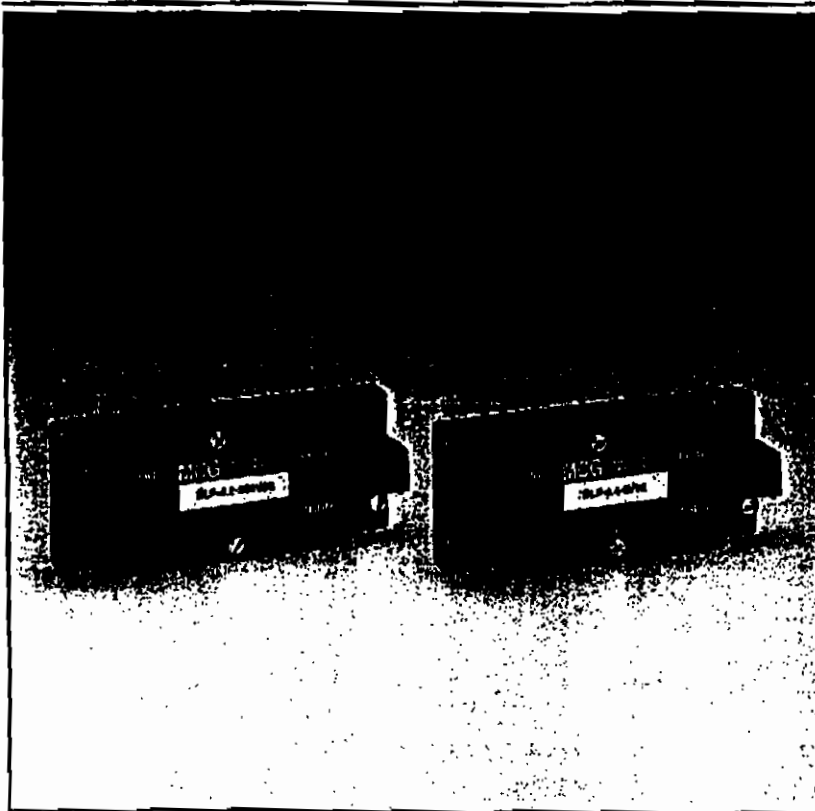
* Connect ground lead to chassis. Maximum length 6 inches.

Typical Application



12 Burt Drive, Deer Park, New York 11729
Phone: (516) 586-5125 Fax: (516) 586-5120

1-800-851-1508



Model DLP-4.2 and DLP-4.4

Stop Computer Damage

Through Dial-up and Leased Lines.

Models DLP-4.2 and DLP-4.4 protect dial-up (tip and ring) and leased line modems and computers from data line overvoltages. Both units are fully tested and certified by MCG professional testing personnel to assure the safety of your valuable equipment.

The DLP-4.2 is a two-wire protector for telephone lines. An array of protection circuitry is available to protect various voltages incorporated in your particular circuitry (6V, 10V, 15V, 25V, 50V, 200V), although the most common voltage is 200 volts. RJ-11 jacks allow simple installation.

The DLP-4.4 is a four-wire protector for

leased lines. The DLP-4.4 is also offered in voltages ranging from 6V to 200V, where the most common is 6V. Using RJ-11 jacks, the unit installs between your sensitive equipment and telephone, or leased line jacks.

Both protectors use gas tube technology and high speed protection circuitry to aggressively protect your equipment. Energy handling capability is as high as 5000 joules one time, or 50 joules repetitively. Units only fail in "equipment safe" mode at an average of only 32 failures per 132,000 circuits.

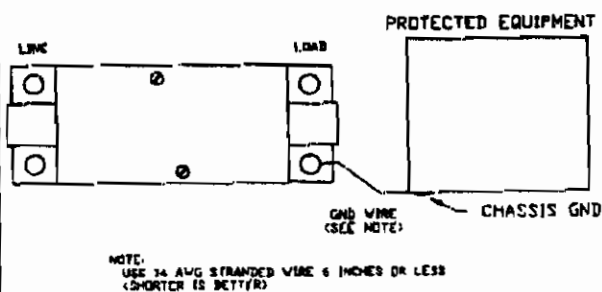
These units will also protect RS-232, RS-422, RS-423 and 20mA current loops.

Models 4.2 and 4.4

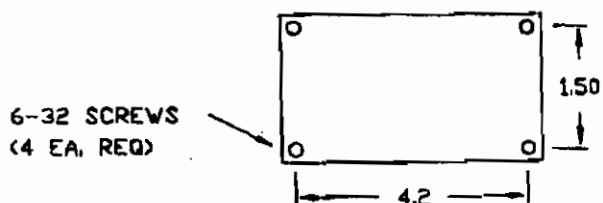
Electrical Specifications

Clamping Voltages:	6V (RS-422, 423) 10V 15V (RS-232 typ.) 25V (RS-232 max.) 50V 200V (Dial-up lines)
Series Resistance:	25 ohms
Meets or Exceeds:	IEEE 587 Cat. B IEEE Std. 472 (SWC) 1kV, (10 x 1000) us waveform FCC Docket 68

Installation Notes



Mounting Diagram



Ordering Information

Please Specify Clamping Voltage From Electrical Spec.

	DLP-4.2 - 6V 25
Basic Model	_____
Protect Voltage	_____
Series Resistance	_____

Model DLP-4.2 Dial-up lines.....\$76.00

Model DLP-4.4 Leased lines.....\$104.00

SECTION E4
LINE METERING SYSTEM

NOTE

All possible contingencies which may arise during installation, operation, or maintenance, and all details and variations of this equipment do not purport to be covered by these instructions. If further information is desired by purchaser regarding his particular installation, operation or maintenance of his equipment, the local Westinghouse Electric Corporation representative should be contacted.



This product is manufactured
and sold by
Cutler-Hammer Inc.
5 Parkway Center
Pittsburgh, PA 15220

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QUICK LIST FOR IQ DATA INSTALLATION

It is suggested that you thoroughly familiarize yourself with the IQ Data User's Manual before attempting installation. This list should be used to assist you.



2. Using the technical manual, pages 18 and 19, set the DIP switches on the back of the IQ Data at the desired values (CT ratio, PT ratio, nominal line voltage).
3. Connect the power leads to the voltage inputs of the IQ Data—directly from the line if 600 volts or below, from PT's for up to 14.4 KV.
4. Connect CT inputs to the CT terminals of the IQ Data. Be extremely careful to connect the inputs correctly and to line up the phases with the voltage.
5. If not using a 3-phase Power Module, then verify that

jumpers are installed correctly for your application (see Paragraph 2.1.2, item 3, page 7). Connect the 120/240 VAC control power to the unit at terminals 7 and 10. When DIP switches have been verified, apply control power to the unit.



7. If you think a problem exists, check the voltage and current readings with hand-held meters. If they are correct, the unit should be operating correctly. If an LED is not functioning, return the device to the factory for repairs.



IMPORTANT

Areas in this manual shaded in gray () pertain only to those units which operate with the optional 3-phase Power Module (IQ Data style number 2D78533G03). If your unit does not have this option, please skip these shaded areas.



Shaded area designates information that replaces or supplements applications using the 3-phase Power Module.

Section 1

INTRODUCTION

1.0 General — The IQ Data is a microprocessor-based, self-contained, door-mounted device designed to both monitor and display electrical parameters. (See Figure 1.1)

The electrical parameters it meters are:

- AC line current (each phase)
- AC line to line voltage (all three)
- AC line to neutral voltage (four-wire systems — all three)

Voltage may be directly monitored on 3-phase AC lines within a range of 120 to 600 VAC nominal without external potential transformers and within a range above 600 VAC to 14.4KV with external potential transformers.

Current monitoring is through external current transformers with ratios between 25/5 to 5000/5.

Typical applications for the IQ Data are:

- Transformer feeder circuits
- Branch circuits
- Motor starters
- 3-phase electrical loads

The unit will auto-range all monitored values displayed on the screen by means of a floating decimal point and UNITS and KILO LED's on the device's faceplate. See Figure 3.1.

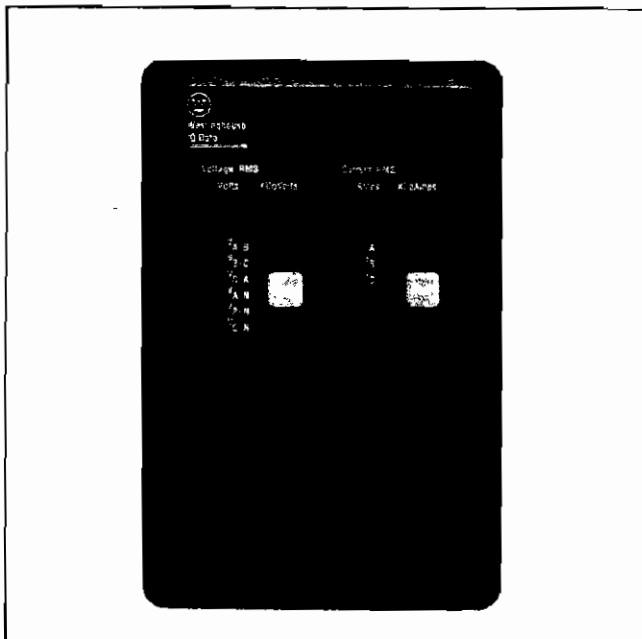


Figure 1.1 — IQ Data

The program directing the monitoring function is permanently stored in the IQ Data, and so there is no need to reload programs after an AC power loss.

The unit's monitoring functions are preprogrammed in the form of software supplied as standard and resident in the IQ Data microprocessor.

The Operator Panel, which makes up the unit's front face, supports two Display Windows which visually indicate the actual value of the metered items selected for display.

The IQ Data is available in two different models. One style (2D78533G01) is powered by separate 120 or 240 VAC control power. The second model (2D78533G03) is packaged with a three-phase Power Module. Power for this device is derived from the line being monitored.

Since the IQ Data has only two models and very few external options, individualizing for an application is performed in the field by the user/OEM. Users choose and enter the specifications for the individual setpoints by setting a series of DIP switches. No specialized programming language is necessary.

1.1 Features and Options — Since the IQ Data is a standardized package, there are very few external options. The options are:

- A 36-inch Extension Cable which allows removal of the 3-phase Voltage Power Module from the chassis for separate mounting.
- A Communications Module (PONI Card). See IL 17158A

The IQ Data is capable of carrying on external data exchanges with a computer by means of a Communication Module. Electrical operating data supplied over a two-wire communication link will support plant energy management systems. This module can be added at any time.

1.2 Required External Hardware — In all instances, it is recommended that the IQ Data use 3 user-supplied external current transformers, with 5 amp secondaries, in order to carry out metering functions involving current. In retrofit cases where only 2 current transformers are provided, see the sample wiring diagrams in Figures 4.4A and 4.4B.

These may be chosen from a wide range of ratios, as is indicated in Table 5.A on page 20.

For applications in which the monitored AC line is 600 VAC, or less, **no external potential transformers are required**. In those cases where the monitored AC supply line exceeds 600 VAC, user-supplied potential transformers are required to step down the voltage to match the maximum allowable voltage permitted by the unit. See Table 5.B (page 21) for the voltage ranges the IQ Data can monitor.

The standard unit requires 120/240 VAC control power to operate. See Figure 2.1A (page 6). The unit mounted with a three-phase Power Module draws its power from the line it is monitoring.

1.3 Use of Manual — This manual is designed for use during installation and troubleshooting and, if necessary, unit replacement. It also has information of specific importance for the user's application engineer who is planning the overall system and who is determining the setpoint values for a specific IQ Data application.

The manual is broad enough in scope to form the basis of new employee familiarization, refresher training sessions, and on-going maintenance.

It is strongly advised that the application engineer carefully read Sections 2 thru 5 before producing the application's wiring plan drawings and filling out the Setpoint Record Sheet. Installation teams should carefully read all of Section 4 **before** starting final installation. Maintenance personnel should be familiar with Section 7 before attempting to service the IQ Data.

1.4 Level of Repair — This manual is written with the assumption that only unit-level troubleshooting will be performed. If the cause of malfunction is traced to an IQ Data, the unit should be replaced with a spare. The malfunctioning unit should then be returned to Westinghouse for factory repairs.

Table 1.A
IQ DATA FEATURES AND BENEFITS

Feature	Benefit
• Microprocessor-based control • Two models • Simplified programming • Standard cutout	• Reliable service without the need for numerous external measuring instruments. • Ease of purchasing, stocking • In many cases eliminates external transformers • Simplified wiring • No special languages to learn • One hole to cut • Interchangeability with IQ Data Plus II, IQ Generator

Table 1.B
COMMUNICATION ARRANGEMENTS

Feature	Benefit
• Communication to an IBM PC (or clone) personal computer. This computer acts as the master and can also be used as the interface to other microprocessor-based devices. • Communications via RS232C to other microprocessor-based products or phone modems.	• A Local Area Network, Westinghouse INCOM, is formed by 2 or more IQ Datas connecting to a personal computer via a shared twisted pair of wires. The personal computer acts as a master. In this arrangement the PONI Communication Module is mounted on each IQ Data. A CONI Communication Card is used in an expansion slot of the personal computer. A standardized software package is provided with the CONI Card for data collection and storage. • Using INCOM, 2 or more IQ Datas (or other IQ products), each with a PONI Communication Module, can be connected to the two wire network to transmit data to a single Translator Module. This module converts INCOM formatted messages to RS232C for use with other RS232C compatible devices. No software is provided in this case.

Section 2

HARDWARE DESCRIPTION

2.0 General — The purpose of this Section is to familiarize the reader with the IQ Data hardware, its nomenclature, and to list the specifications of the unit.

2.1 Hardware Description — The IQ Data is designed to be mounted through a cutout in a panel. (This will generally be a cabinet's face or door.)

The description here is divided into the following:

- Operator Panel (Par. 2.1.1)
- Rear access area (Par. 2.1.2)
- External hardware (Par. 2.1.3)

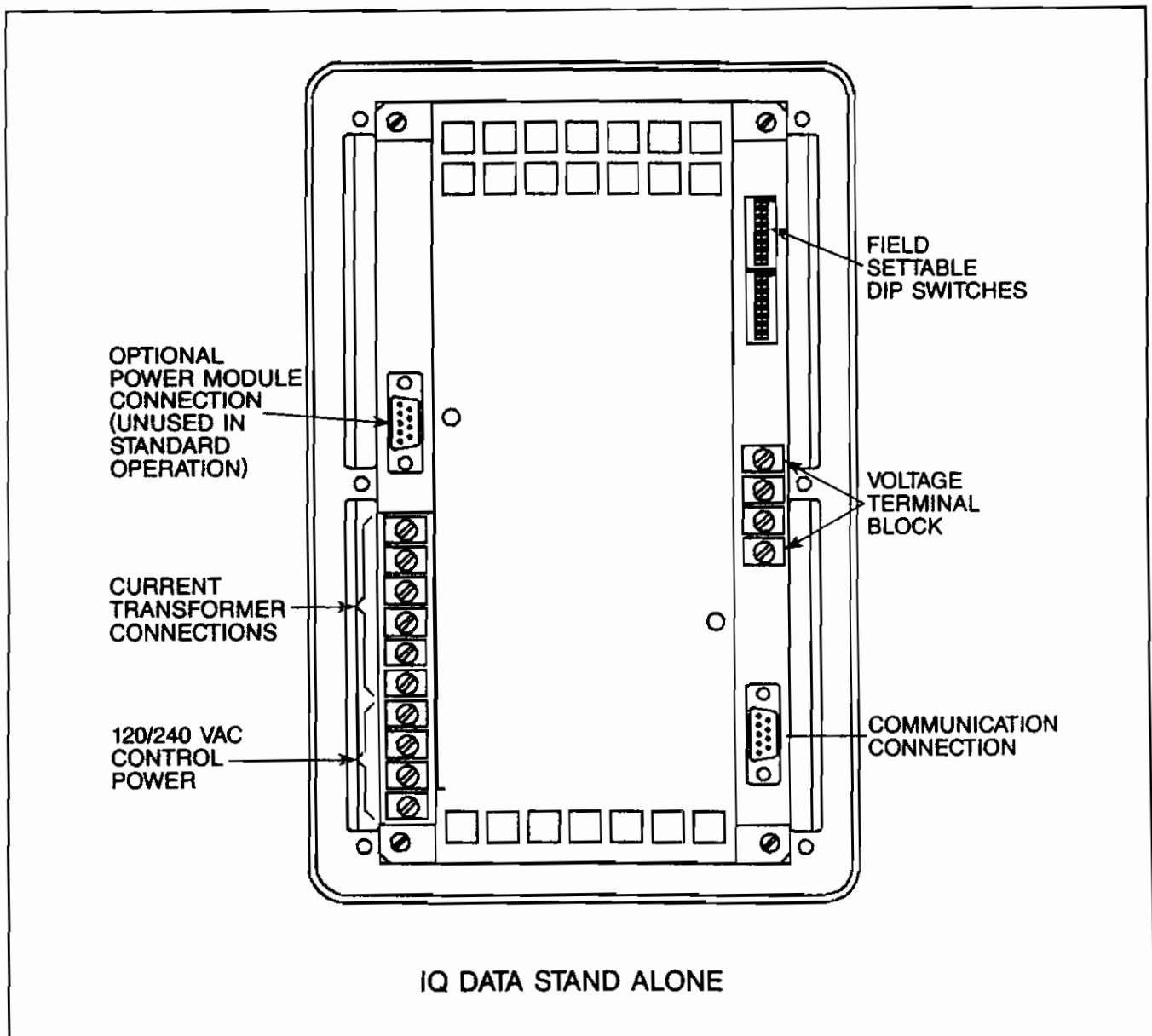


Figure 2.1A — Rear Access Area

2.1.1 Operator Panel — The Operator Panel, which is normally accessible from the outside of the panel or door, provides a means to:

- Monitor the actual metered values on the Display Window. (See Figure 3.1.)
- Determine which metered value is being displayed by means of an illuminated LED located at the left of the monitor menu
- Step through the menu of metered items and actual values

The use of the Operator Panel is detailed in Section 3.

2.1.2 Rear Access Area — The rear of the IQ Data is normally accessible from the rear of the panel's door. All wiring connections to the unit are made at the chassis' rear.

When using the IQ Data without the 3-phase Power Module, study Figure 2.1A and note the following items:

1. The 3-phase line voltage connects to the unit on the right side of the unit. These contacts can accept an input from 120 volts to 600 volts without external potential transformers. Phase A, B, C and Neutral.
2. Connections from the 3 required external current transformers are made at the Current Transformer Terminal Block located on the left side of the chassis.
3. The 9-pin connector on the upper left of the unit is unused in this case. 120 or 240 VAC must be supplied to terminals 7 and 10. For 120 VAC operation, jumpers must be installed from terminals 8 to 10 and 7 to 9. For 240 VAC operation, a jumper must be installed from terminal 8 to 9. This will supply control power to the IQ Data independent

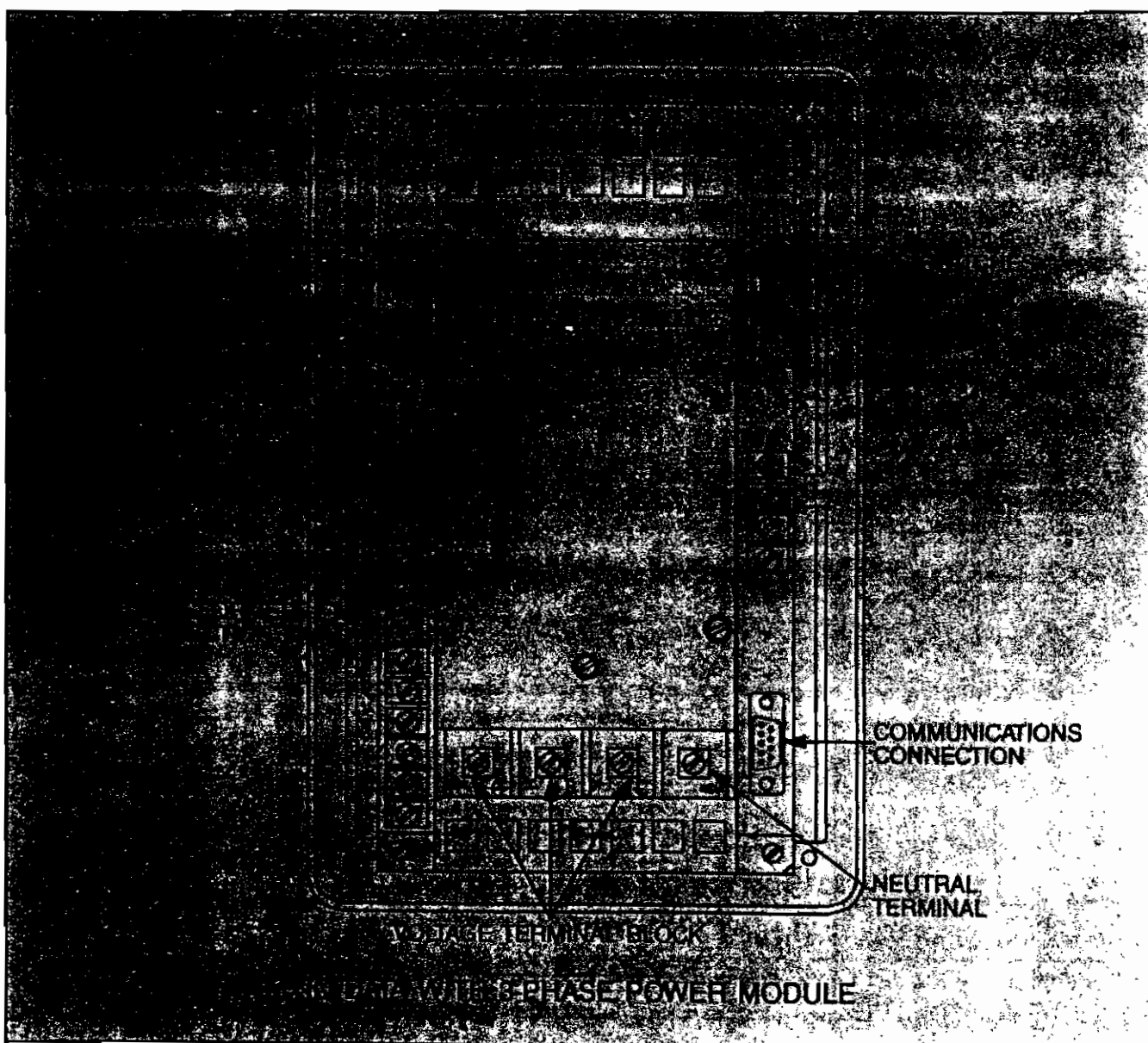


Figure 2.1B — IQ Data with 3-Phase Power Module

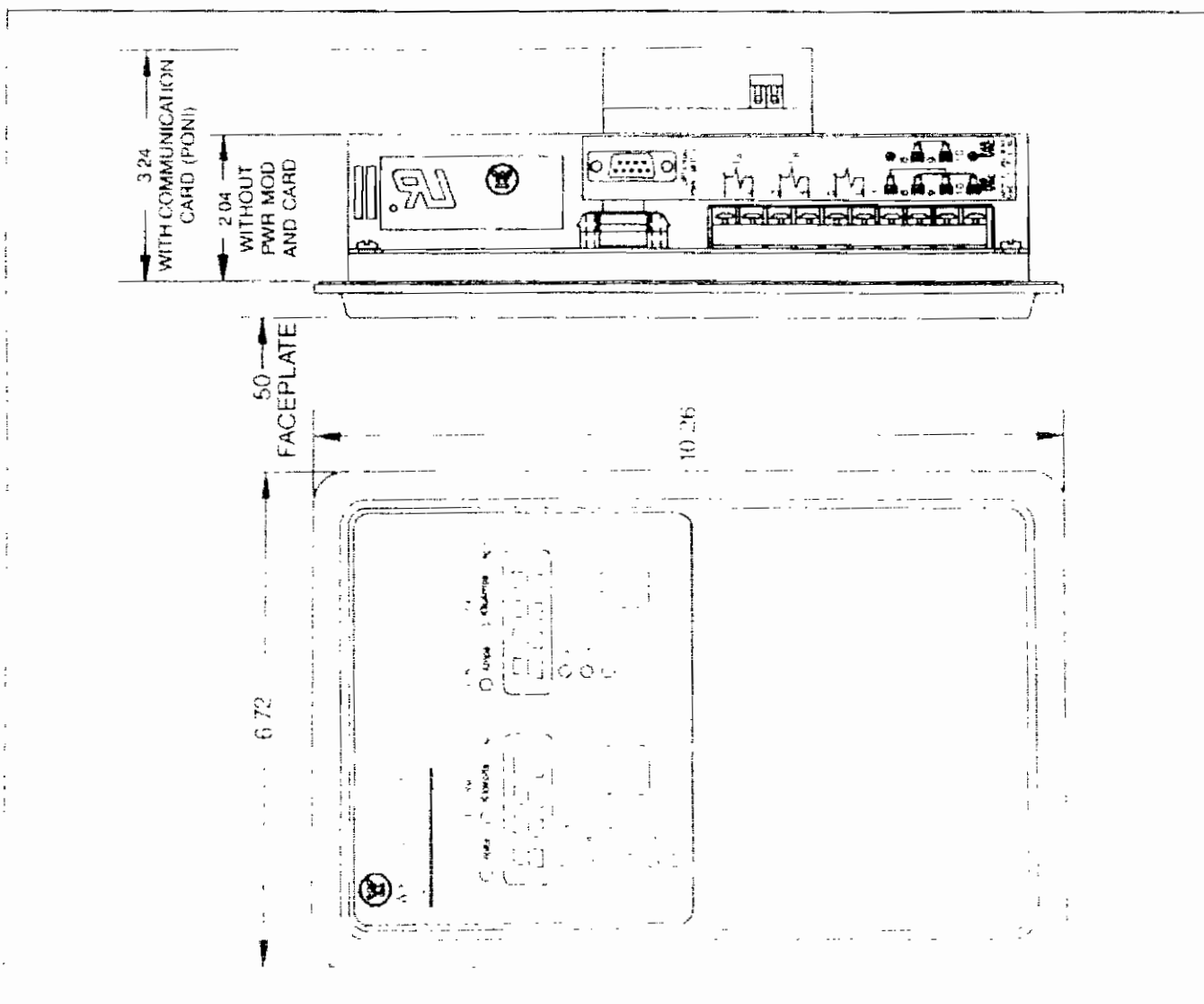
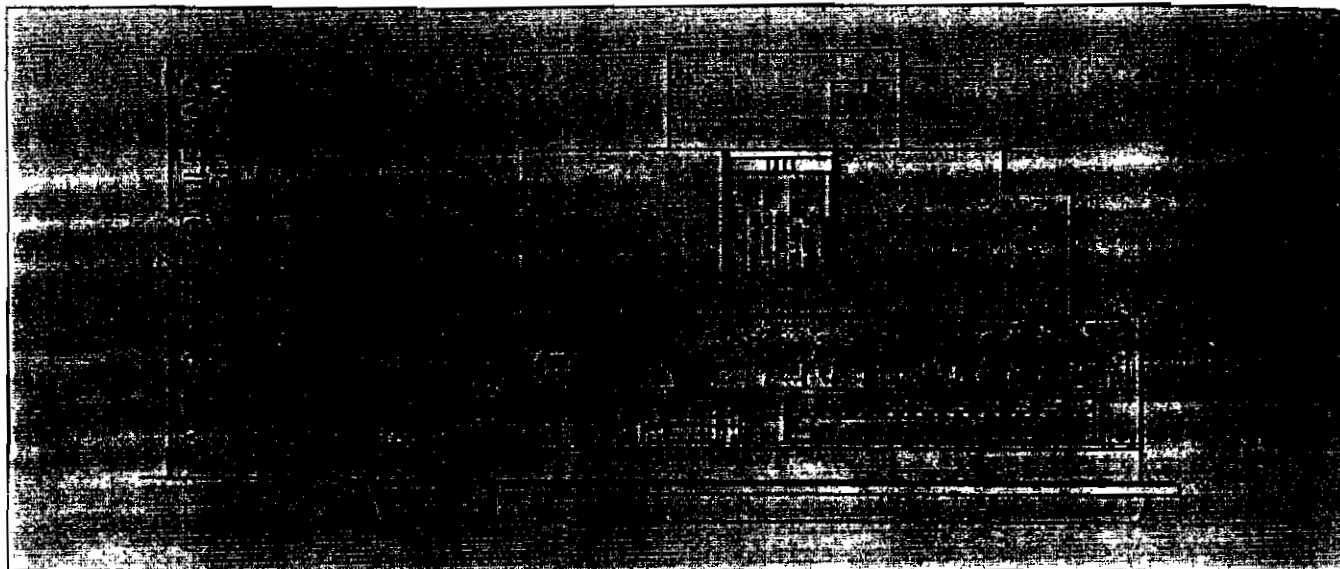


Figure 2-2. Dimensions

NOTES: 1. THE DEVICE IS DESIGNED TO BE USED IN A RACK. 2. THE DEVICE IS DESIGNED TO BE USED IN A RACK. 3. THE DEVICE IS DESIGNED TO BE USED IN A RACK.

4.1.3 Voltage Configuration

4. A neutral is provided for 4-wire systems. (Where the monitored AC lines are a 3-wire configuration, this terminal is not to be wired.) Note: This neutral connection must be at the same potential as the ground connection used at the current transformers.
5. DIP switches, located on the right side of the chassis, tailor each IQ Data to a specific application. These DIP switches are set according to characteristics such as the external PT and CT ratios. A complete description of each DIP switch setting is listed in Section 4.
6. A Communication Port, located on the lower right of the chassis, is designed to connect with an optional Communication Module (PONI Card).

When the Voltage Power Module (See Figure 4.3) and not included in the IQ Data chassis, it must be connected to the incoming AC power lines. The Voltage Power Module is connected to the incoming AC power lines and provides the voltage connections.

3.4.1.3.1. The Voltage Power Module is factory shipped mounted on the rear of the IQ Data chassis. This component may be detached from the chassis and moved up to 36 inches (91.44 cm) away if local codes prevent AC power devices being located on the cabinet door. An extension cable must be specified in this case.

7. The Voltage Power Module is factory shipped with a ground bar, which is to be grounded by the user during installation to match the incoming voltage ranges. (Installation procedures, along with a listing of ranges, are given in Paragraph 4.1.4.1.)

8. The Voltage Power Module is factory shipped mounted on the rear of the IQ Data chassis. This component may be detached from the chassis and moved up to 36 inches (91.44 cm) away if local codes prevent AC power devices being located on the cabinet door. An extension cable must be specified in this case.

9. A fuse is located in series with each of the 3 incoming AC lines. The fuses are 3/4 Amp, 600 volt, 200 kA interrupting rating. These fuses are internal to the Power Module and can be accessed by removing the three screws holding the cover in place. (See Figure 4.3) If it is necessary to replace fuses, make sure all voltage has been removed from the IQ Data before removing/replacing the fuses.

2.1.3 External Hardware — Each IQ Data requires current transformers be wired into the CT Terminal Block from an external location. (See Figures 4.4A - 4.4F) These are user-supplied and must have a 5 ampere secondary.

Potential transformers are required when line voltage is above 600 volts. These are wired directly to the AC Line Connection Terminals. (See Figures 4.4B, 4.4D and 4.4F.)

2.2 Specifications — The following specifications of the IQ Data are contained here:

- General specifications (Table 2.A)
- Metering specifications (Table 2.B)

Table 2.A
GENERAL SPECIFICATIONS

Device's Power Requirement
PT Burden
0.02 VA
With 3-phase Power Module
10 VA
CT Burden
1.25 VA
Frequency
50/60 Hz
Line Characteristics
• Nominal Line $\pm 20\%$
• Will continue to operate in event of a phase loss
Operating Temperature
18° to 70°C (32° to 158°F)
Storage Temperature
-20° to 85°C (-4° to 185°F)
Humidity
3 to 95% R.H. noncondensing
Fuses
(Supplied with the unit) 3/4 ampere, 600 volts
Buss Type KTK-R 3/4 (3 required)

(1) DIP switch must be set for the correct incoming frequency.

Table 2.B METERING SPECIFICATIONS

Item	Description	Accuracy in % of Reading
1	Phase A, B, C	
2	Phase A, B, C, D, E, F	
3	Phase A, B, C, D, E, F, G, H	
4	Phase A, B, C, D, E, F, G, H, I, J	
5	Phase A, B, C, D, E, F, G, H, I, J, K, L	
6	Phase A, B, C, D, E, F, G, H, I, J, K, L, M, N	
7	Phase A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P	
8	Phase A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R	
9	Phase A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T	
10	Phase A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V	
11	Phase A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z	

Section 3

OPERATOR PANEL

3.0 Introduction — This Section describes the operation of the IQ Data. It is divided into the following 3 Sections:

- Pushbuttons (Par. 3.1)
- LEDs (Par. 3.2)
- Display Windows (Par. 3.3)

3.1 Membrane Pushbuttons — The Operator Panel supports 2 membrane pushbuttons. (See Figure 3.1.) Both membrane pushbuttons perform the following function:

- **STEP Display.** Pushbuttons are used to step through the monitored items listed on the respective monitor menus shown on the Operator Panel's face. Each time one of these pushbuttons is pressed, the LED at the left of the newly selected monitored item is illuminated. At the same time the current operating value corresponding to that

item is shown in the Display Window.

For example, while the V_{AB} LED is illuminated, the STEP pushbutton is pressed once. Immediately the LED next to V_{BC} lights, and a new value is shown in the Display Window.

Table 3.A contains a description of each of the 9 items that can be displayed.

3.2 LEDs — The Operator Panel LEDs are divided into 2 types:

3.2.1 Menu LEDs. At any given time, two of the LEDs associated with a menu item are illuminated. (See Table 3.A for a listing of these 9 items.) Each acts to identify which menu item value is currently being shown in the Display Window.

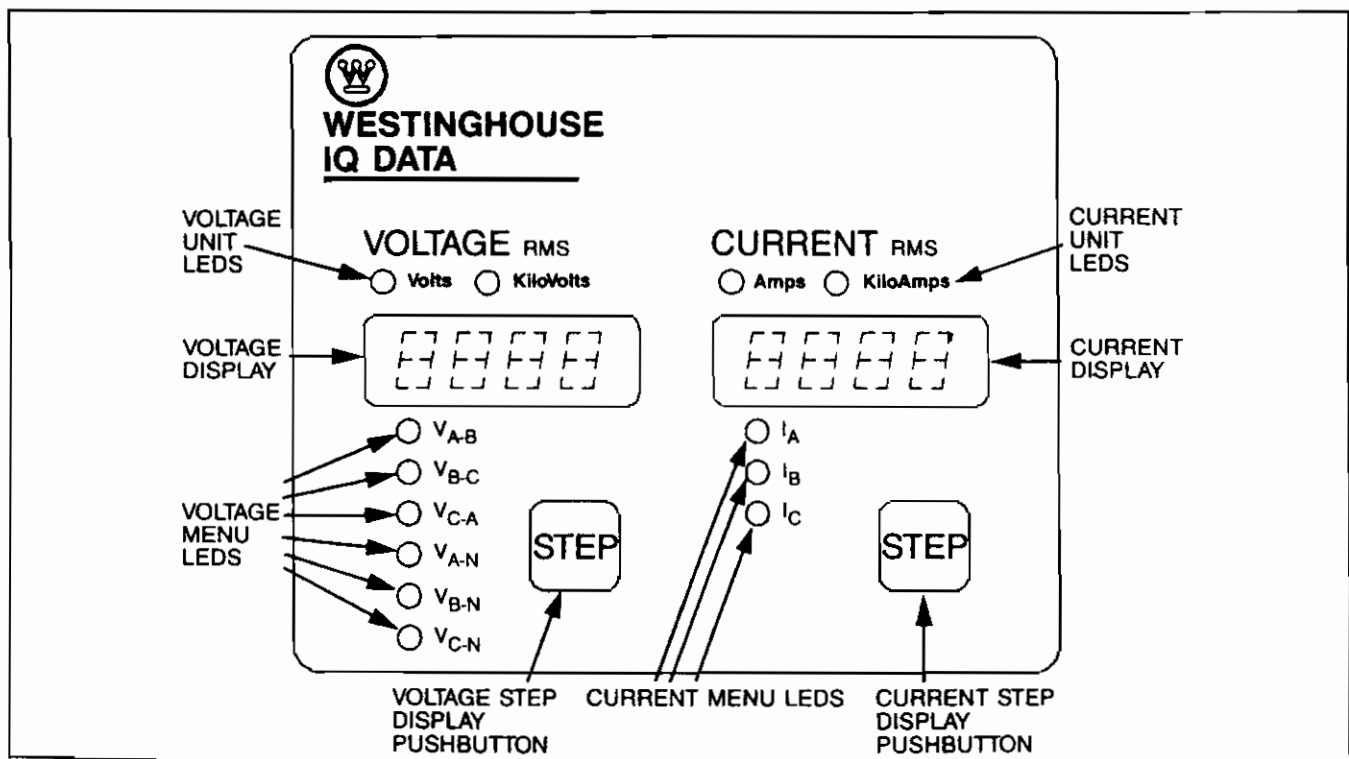


Figure 3.1 Operator Panel

Table 3.A
METERED VALUES

Selection		Display Format	Description
V_{A-B} Volts RMS	V KV	XXXX or XX.XX	Phases A-to-B
V_{B-C} Volts RMS	V KV	XXXX or XX.XX	Phases B-to-C
V_{C-A} Volts RMS	V KV	XXXX or XX.XX	Phases C-to-A
V_{A-N} Volts RMS (1)	V KV	XXXX or XX.XX	Phase A-to-neutral
V_{B-N} Volts RMS (1)	V KV	XXXX or XX.XX	Phase B-to-neutral
V_{C-N} Volts RMS (1)	V KV	XXXX or XX.XX	Phase C-to-neutral
I_A Amps RMS I_B Amps RMS I_C Amps RMS	Amps K Amps	XXXX or XX.XX	Phase currents

(1) These values are skipped automatically with systems which do not wire the neutral line to the Neutral Terminal of the IQ Data. The blanking occurs when position 8 of SW1 is set for the 3-wire position.

3.2.2 Units LEDs: Auto range units for monitoring — Units and KILO. Units will be displayed until a value above 9999 is reached.

3.3 Display Windows — The twin 4-digit LED Display Windows display two of the 9 metered values listed in Table 3.A at any given time. (See Paragraph 3.1 for details on selecting an individual value.)

Section 4

INSTALLATION AND STARTUP

4.0 Introduction — This Section describes the following items associated with the installation and startup of the IQ Data:

- Mounting (Par. 4.1)
- Wiring (Par. 4.2)
- DIP switch setting (Par. 4.3)
- Initial startup (Par. 4.4)

Earlier Sections, especially Section 2, Hardware Description, should be read by anyone using this Section to install an IQ Data.

4.1 Panel Preparation — This Paragraph describes the panel preparation and mounting of the IQ Data.

4.1.1 Cutout, Clearances — Since the IQ Data is typically mounted on a cabinet's door, it is necessary to prepare a

cutout in which it will be placed. The dimensions for this cutout, along with the location of 6 mounting holes, are shown in Figure 4.1. Before actually cutting the panel, be sure that the required 3-dimensional clearances for the IQ Data chassis allow mounting in the desired location. (Clearances are shown in Figure 2.2.)

It is necessary to hold fairly close to tolerances when making the cutout and placing the holes for the mounting screws. In particular the horizontal dimension between the center of the mounting holes and the cutout's vertical edge must be within 0 and +0.050 in. (0.13 cm).

4.1.2 Mounting — Do not use a tap on the face since this will remove excessive plastic from the holes, resulting in less threaded material to secure the IQ Data to its mounting panel.

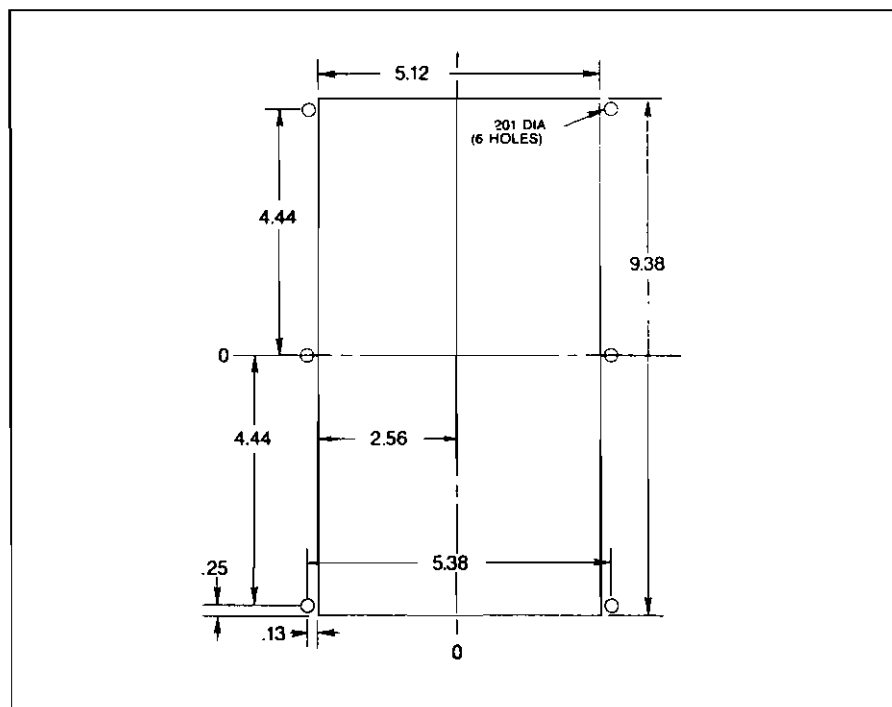


Figure 4.1 Chassis Cutout Dimensions

These dimensions must be -0 and +0.050 in.

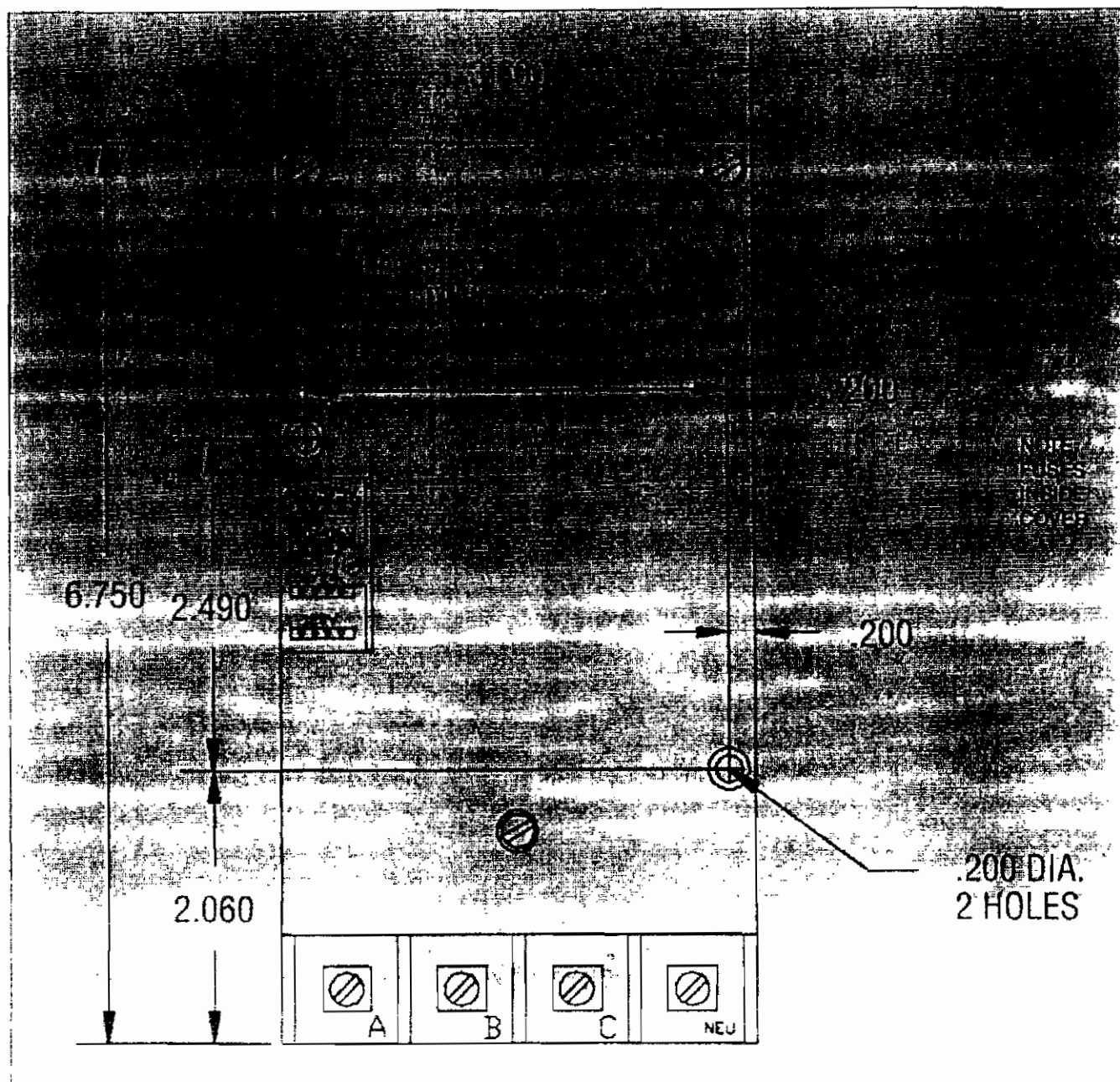


Figure 4.2 Optional Power Module

Place the module through the slot in the line. Be sure the Operator Panel faces outward. Use 20 in. (508 mm) long screws provided with the IQ Data to mount the unit in a secure position. Do not use the screws provided with the module to mount it through the chassis.

4.1.3 Optional Power Module — In those cases where it is necessary to remove the Power Module and mount it separately from the chassis, be sure that:

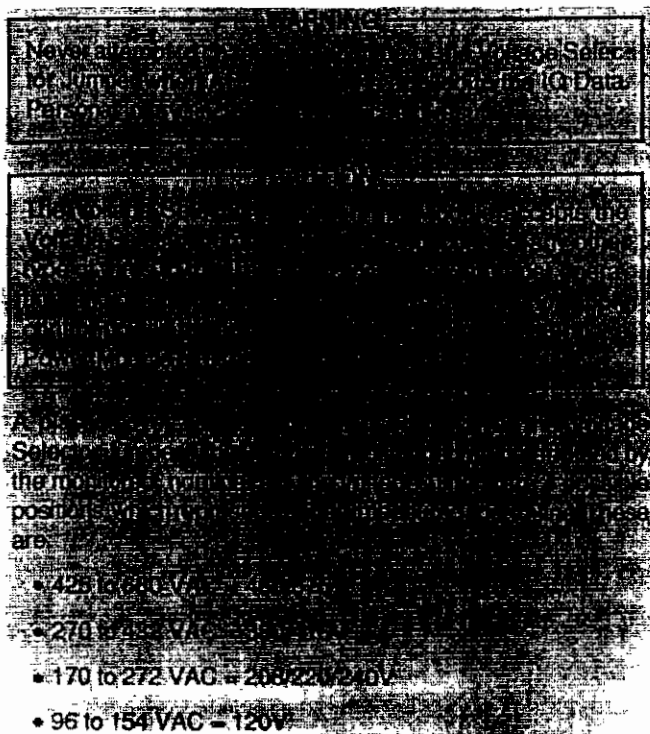
- The location allows for a cable connection between the IQ Data chassis and Power Module by means of the 36 in. (914 mm) Extension Cable Option
- The optional Power Module can physically fit into the

location desired. (See clearance dimensions in Figure 4.2.)

Use the Module as a drilling template at the desired location. The two 8-32 screws can be used to remount the Module in holes properly drilled and tapped.

4.1.4 Voltage Selector Jumper — It is necessary to match the placement of the Voltage Selector Jumper with the incoming AC line voltage, measured line-to-line. (See Figure 2.18.)

Rated area for optional extension cable that can be used to connect the Power Module to the IQ Data chassis.



These ranges are indicated on the Power Module, as shown in Figure 4.3. Consult the wiring plan drawings prepared by the user or OEM to determine the required line voltages. Change the Selector Jumper for the Line Voltage when not using potential transformers. When using potential transformers with a 120 volt secondary, the Selector Jumper should be positioned for 96-154 volt range.

After repositioning the Jumper, replace plastic cover and secure with screw.

4.2 Wiring The wiring of the IQ Data must follow a suitable wiring plan drawing. The term wiring plan is used here refers to the drawings made for the specific application. It describes all electrical connections between the IQ Data and

the machine or process equipment. This is made up by the user or OEM.

A typical wiring plan is shown in Figures 4.4A thru 4.4E. Observe the Figures and note the following:

1. Phasing and polarity of the AC current inputs and the AC voltage inputs
2. The incoming AC line phases A, B and C wire directly to the AC Line Connection Terminals on the chassis, when line voltage is 600 volts or less.
3. The wires connecting to the IQ Data must not be larger than AWG No. 14. Larger wires will not connect properly with the various terminal blocks
4. Wiring between the current transformers and the IQ Data should be kept as short as possible (200 feet max.). Also, whenever possible, route these lines away from other AC lines and inductive devices. If the lines must cross other AC lines, plan to cross them at right angles
5. Terminals ground, 2, 4, and 6 should be maintained at the same potential to prevent errors in the current metering. If the IQ Data is to read line-to-neutral voltages, the Neutral must be connected to the system ground or terminals 2, 4, and 6 must be connected to Neutral.

All wiring must conform to applicable federal, state, and local codes.

WARNING

Ensure that the incoming AC power and all "foreign" power sources are turned OFF and locked out before performing any work on the IQ Data or its associated equipment. Failure to observe this practice can result in serious or even fatal injury, and/or equipment damage.

Shaded area designates information that replaces or supplements applications using the 3-phase Power Module.

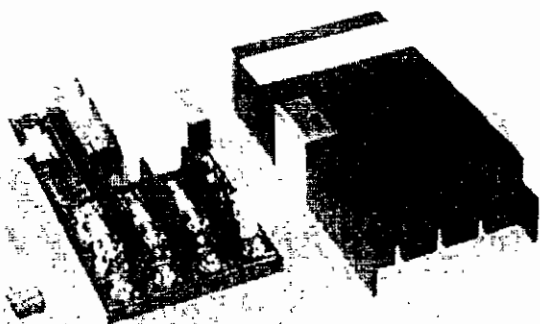


Figure 4.3 — Fusing for 3-Phase Power Module

3 PHASE 3 WIRE (UP TO 600 VOLTS)

2 CT'S WITH IO DATA

DIRECT VOLTAGE CONNECTION & EXTERNAL CURRENT TRANSFORMERS

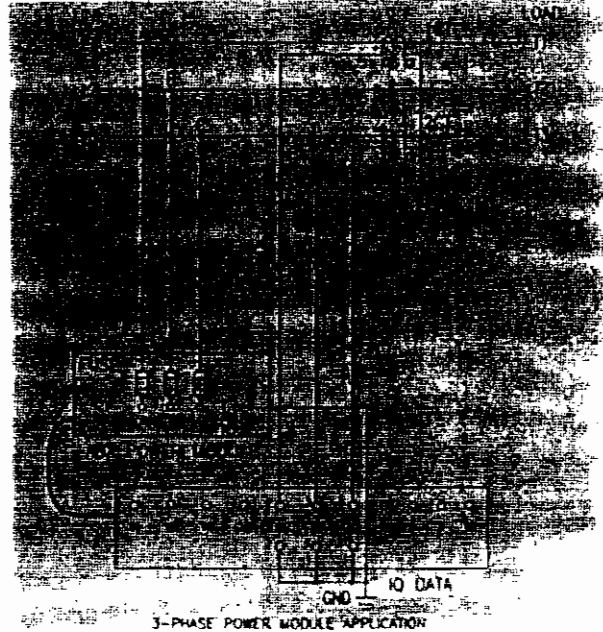
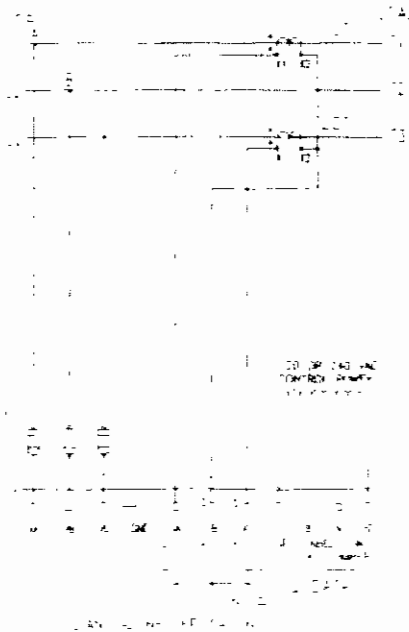
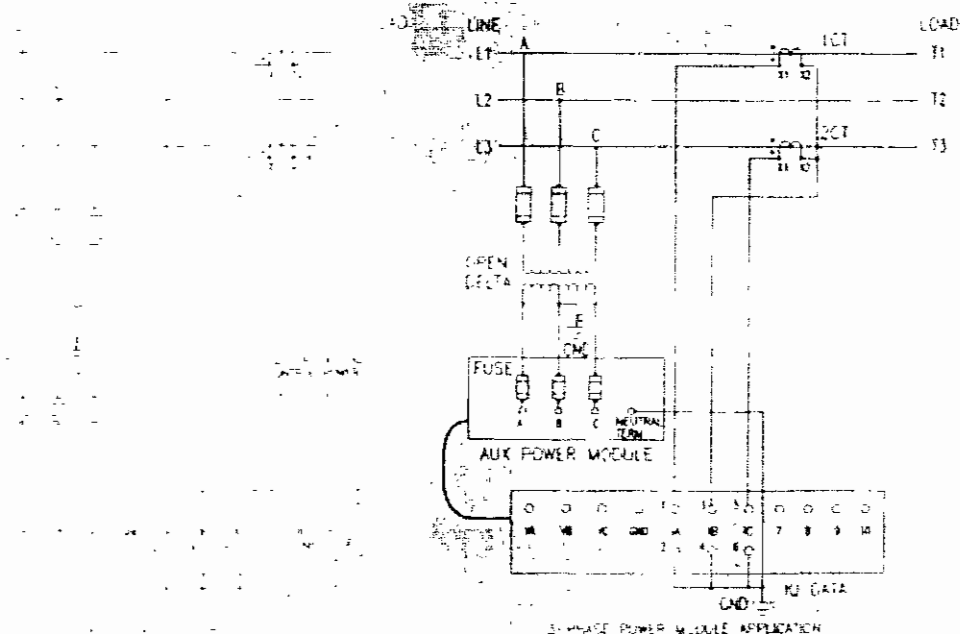


Figure 4.4A — Wiring Diagram

3 PHASE 3 WIRE (ABOVE 600 VOLTS)

2CT'S WITH IO DATA

EXTERNAL POTENTIAL TRANSFORMERS & CURRENT TRANSFORMERS



3-PHASE POWER MODULE APPLICATION

Figure 4.4B — Wiring Diagram

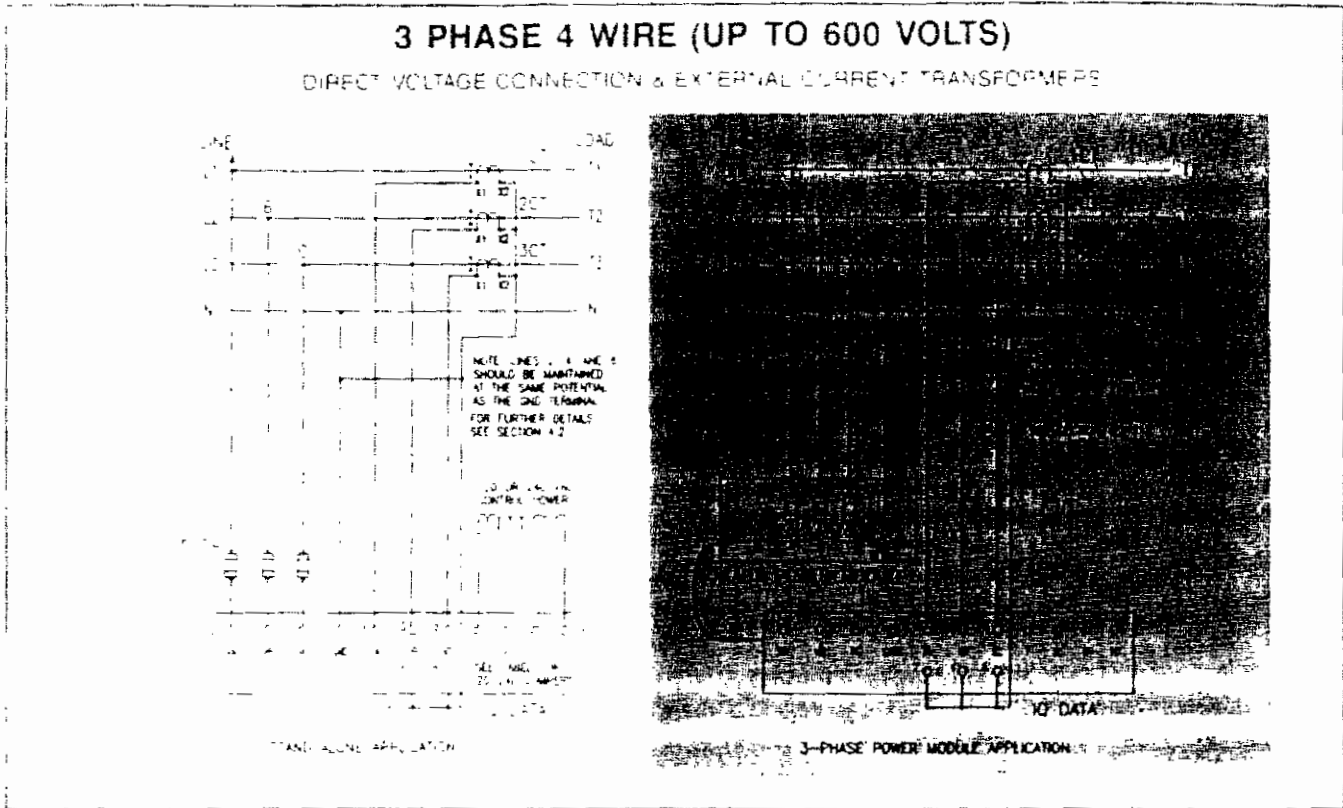


Figure 4.4C — Wiring Diagram

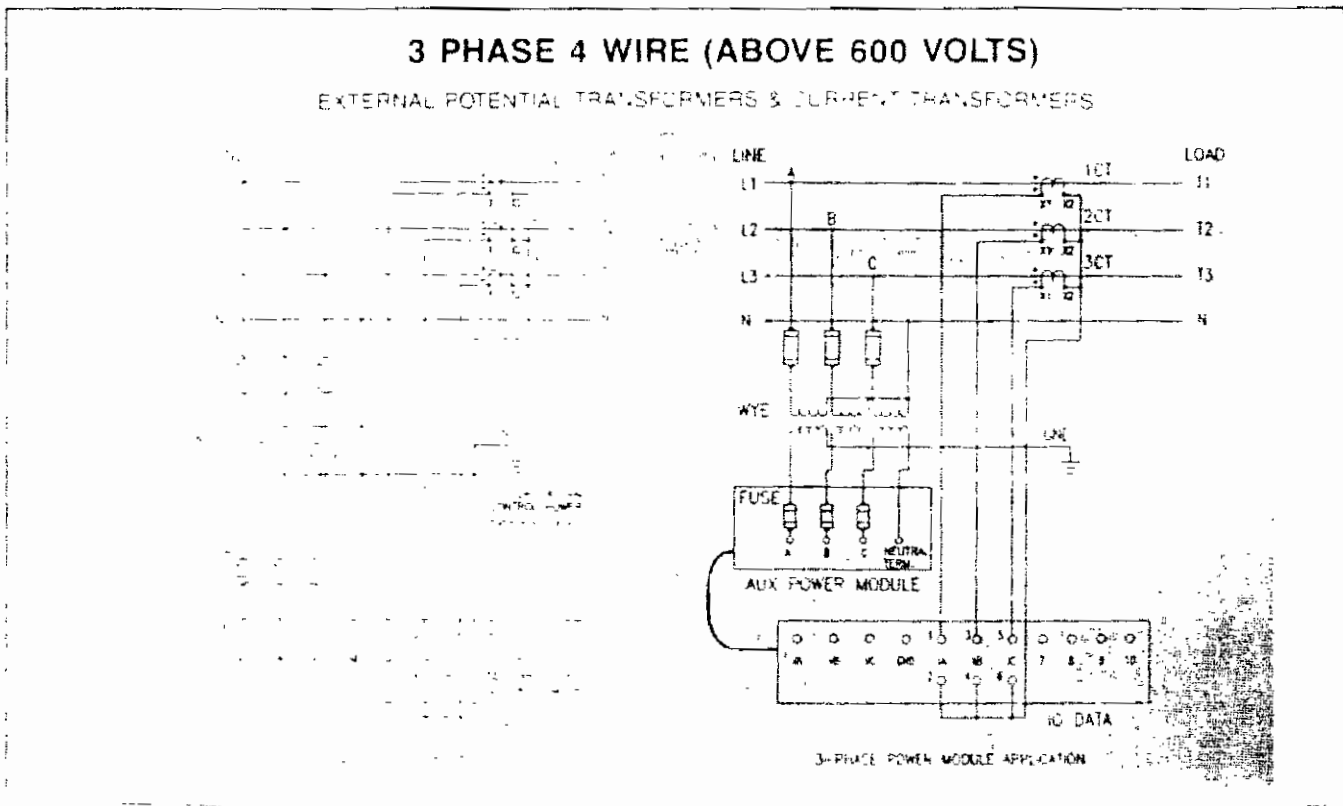


Figure 4.4D — Wiring Diagram

shaded area designates information that replaces or supplements applications using the Auxiliary Power Module

3 PHASE 3 WIRE (UP TO 600 VOLTS)

DIRECT VOLTAGE CONNECTION & EXTERNAL CURRENT TRANSFORMERS

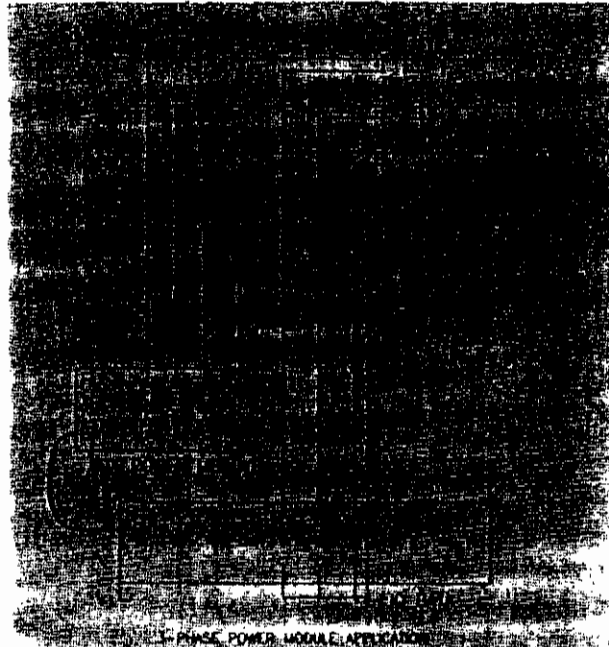
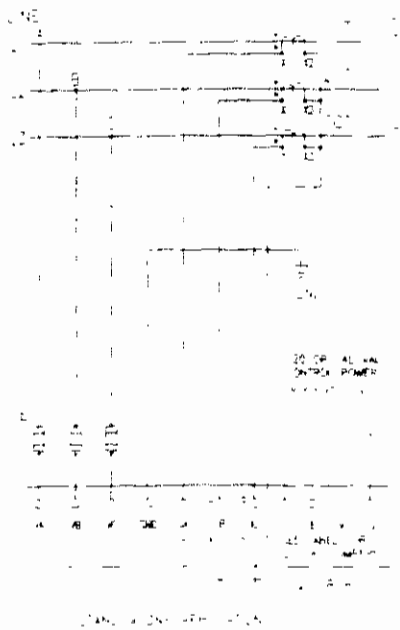


Figure 4.4E — Wiring Diagram

3 PHASE 3 WIRE (ABOVE 600 VOLTS)

EXTERNAL POTENTIAL TRANSFORMERS & CURRENT TRANSFORMERS

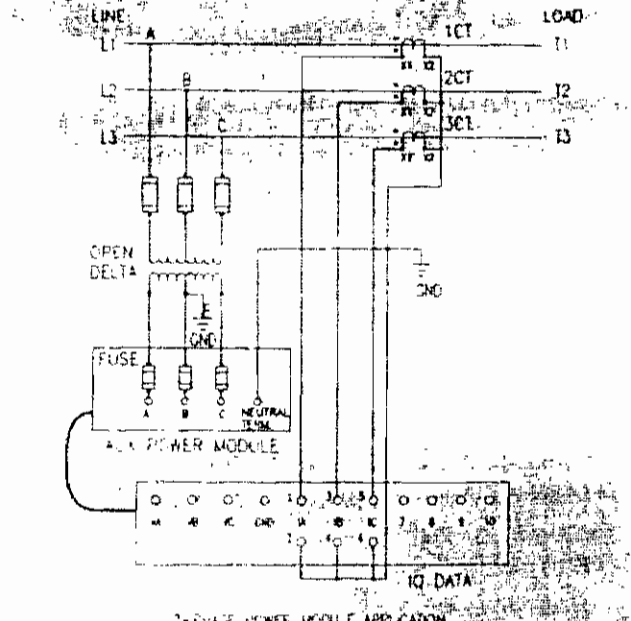


Figure 4.4F — Wiring Diagram

shown here designates only a portion that
up to 600V. For supplements applications using
the 3-phase Power Module.

4.3 DIP Switch Settings — The DIP switches located and accessed from the rear-right portion of the chassis must be properly set according to application requirements. Obtain the Installation Record Sheet produced specifically for the application. A blank Record Sheet is shown in the Table 4.A, page 19. Both DIP switches contain eight 2-position switches which are set in combination. (See Figure 4.5.) The switches are turned ON or OFF by sliding the switch. As you face the DIP switches, slide:

- To the **LEFT** to turn the switch **OFF**
- To the **RIGHT** to turn the switch **ON**

Figure 4.6 shows a side view of a single slide switch and how it is turned on and off.

Observe the ON and OFF designations on the DIP switches shown in Figure 4.5. Always look for the OFF and ON designations on the hardware or printed circuit board to be sure you are setting the switches correctly.

After all the DIP switches are set according to the settings listed on the Installation Record Sheet, the system is ready to have AC power applied. Follow the procedure listed in Paragraph 4.4 when first applying power to the IQ Data.

4.4 Initial Startup — The information here is intended to be used when first applying AC power to the IQ Data. Each item is shown with a box to the left. In this way it can be used as a checklist to reduce the chance of omitting or skipping an item.

• WARNING

The following startup procedures must be performed only by qualified personnel who are familiar with the IQ Data and its associated electrical and/or mechanical equipment. Failure to observe this caution can result in serious or even fatal personal injury and/or equipment damage.

4.4.1 Before Power Application — Before applying AC power to the IQ Data, perform the following:

- ☐ Verify that the incoming AC power to the system is disconnected.
- ☐ Verify all DIP switches are set according to the Installation Record Sheet.
- ☐ If using the Single Phase Power Module, verify that the position of the Voltage Selector Jumper is set to match the incoming line voltage. Verify that the position of the Voltage Selector Jumper is correct for the nominal voltage.
- ☐ Verify that all wiring is correct, as shown on the wiring plan drawings.

4.4.2 Initial Power Application — Perform the following steps when first applying AC power to the IQ Data:

If installing an IQ Data without a three-phase Power Module (2D78533G01):

- Apply 120 or 240 VAC to terminals 7 and 10 of the unit. Zeros should appear in both screens and the V_{AB} and I_A LEDs should be lit.

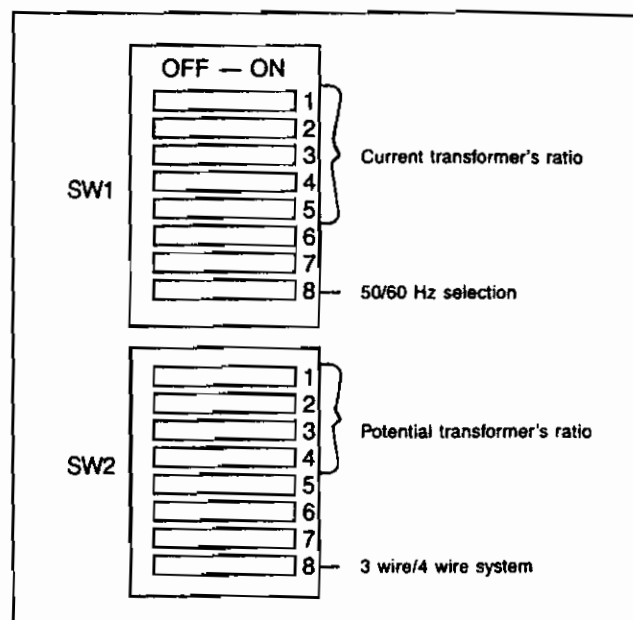


Figure 4.5 DIP Switches

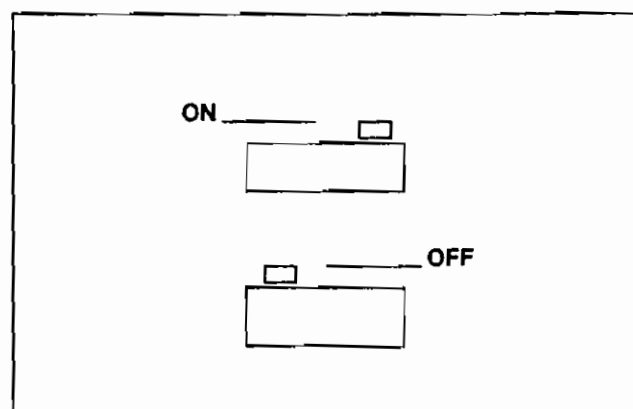


Figure 4.6 — DIP Switch (side view)

- ☐ Turn on AC power and verify the voltage and current values shown.

This is the last step if installing an IQ Data without a three-phase Power Module.

If installing an IQ Data with a three phase Power Module (2D7B533G03):

- ☐ Remove Ethernet network interface card
- ☐ Remove hard drive
- ☐ Remove floppy disk drive
- ☐ Remove IDE controller
- ☐ Remove SCSI controller
- ☐ Remove serial port
- ☐ Remove USB controller
- ☐ Remove video adapter
- ☐ Remove audio adapter
- ☐ Remove modem
- ☐ Remove AC power and cooling fan

Shaded area designates information that replaces or supplements applications using the 3-phase Power Module.

The V_{max} LED indicates the maximum voltage present in the line phase A input and the actual line phase A voltage.

Table 4.A
IQ DATA INSTALLATION RECORD SHEET

DIP Switch	Slide Switch	Setting ON/OFF Combinations	Description
SW1	1 2 3 4 5	— — — — —	The ratio of the external current transformers Refer to Table 5.A, page 20
	6 7	— —	Unused Unused
	8	—	Line frequency ON = 60 Hz OFF = 50 Hz
SW2	1 2 3 4	— — — —	Potential transformers * used Refer to Table 5.B, page 21
	5 6 7	— — —	Unused Unused Unused
	8	—	ALL LEADING OFF 4 W = ON 3 W =

Shaded area designates information that replaces or supplements applications using the 3-phase Power Module.

Section 5

APPLICATION CONSIDERATIONS

5.0 General — This Section contains various considerations to be kept in mind when applying the IQ Data to a specific application. It is designed primarily for the systems or application engineer responsible for making up the wiring plan drawings.

It is strongly suggested that all earlier Sections — especially 2 and 3 — be read thoroughly before proceeding.

5.1 DIP Switch Settings — A number of DIP switches, located on the right rear side of the chassis, tailor each IQ Data to a specific application. The switches provide 4 selection groupings which must be set by the user during installation. Once these settings are determined, they should be recorded on a copy of the Installation Record Sheet, shown in Table 4.A, page 19. The filled-in Record Sheet should then be made available to the installation team and to maintenance personnel. Paragraph 4.3 describes how to physically set the switches.

5.1.1 Current Transformer Ratio — The ratio of the user-provided external current transformers can vary from 25:5 to 5000:5. Switch SW1, Nos. 1 thru 5 must be set to correspond to the external current transformer's ratio, as listed in Table 5.A.

5.1.2 Display Current — The AC line current level appearing in the Display Window is auto ranged to represent amperes to kiloamperes.

5.1.3 Line Frequency — The IQ Data can accept a line frequency of either 50 or 60 Hz. Selection is made at SW1, No. 8. Place the switch in the:

- OFF position for a 50 Hz line
- ON position for a 60 Hz line

Table 5.A
CT RATIO SETTINGS

CT Ratios	SW1 Switch Settings ⁽¹⁾				
	1	2	3	4	5
25:5	ON	ON	ON	ON	ON
50:5	OFF	ON	ON	ON	ON
100:5	ON	OFF	ON	ON	ON
150:5	OFF	OFF	ON	ON	ON
200:5	ON	ON	OFF	ON	ON
250:5	OFF	ON	OFF	ON	ON
300:5	ON	OFF	OFF	ON	ON
400:5	OFF	OFF	OFF	ON	ON
500:5	ON	ON	ON	OFF	ON
600:5	OFF	ON	ON	OFF	ON
800:5	ON	OFF	ON	OFF	ON
1000:5	OFF	OFF	ON	OFF	ON
1200:5	ON	ON	OFF	OFF	ON
1500:5	OFF	ON	OFF	OFF	ON
1600:5	ON	OFF	OFF	OFF	ON
2000:5	OFF	OFF	OFF	OFF	ON
2500:5	ON	ON	ON	ON	OFF
3000:5	OFF	ON	ON	ON	OFF
3200:5	ON	OFF	ON	ON	OFF
4000:5	OFF	OFF	ON	ON	OFF
5000:5	ON	ON	OFF	ON	OFF

(1) All other combinations are invalid.

NOTE: CT'S ORIGINALLY SUPPLIED WERE 300:5
CHANGED BY CUTLER HAMMER SERVICE
ENGINEER TO 150:5 ON FEB. 1, 2000

5.1.4 Potential Transformer's Ratio — Some systems may include optional, user-provided potential transformers. Their ratios must be taken into account by means of settings on Switch SW2, Nos. 1, 2, 3 and 4, as listed in Table 5.B.

CAUTION

When external potential transformers are used, calculate the secondary output level of the transformers by dividing the nominal voltage input to the PT's primary side by the turns ratio. The result must be 120 VAC, measured line-to-line.

Examples:

1. 4160 Volt System: Select a potential transformer with a 4160/120 ratio = 35/1. Therefore, set switch SW2 for 35:1 ratio.
2. 3300 Volt System: Select a potential transformer with a 3600/120 ratio = 30/1. Therefore, set switch SW2 for 30:1 ratio.

If potential transformers are not used, select a ratio of 1:1.

5.1.5 3 Wire/4 Wire Line — The IQ Data can be used to monitor either a 3-conductor or 4-conductor AC line. An example of a 4-wire system is a case in which a transformer's secondary is wired in a wye configuration with the G neutral terminal ground brought out as the fourth wire. In this case the G fourth wire connects with the Neutral Terminal on the IQ Data's chassis. (See Figure 2.1A.)

Switch SW2, No. 8 must be set to correspond to the chosen wiring configuration. Set this switch to the:

- OFF position for a 4-wire wiring configuration
- ON position for a 3-wire wiring configuration

When the OFF position is selected for the 3-wire configuration, the Display Window does not display the 3 line-to-neutral AC line measurements of the Operator Panel's menu. The measurements not displayed are:

- V_{A-N} Volts RMS
- V_{B-N} Volts RMS
- V_{C-N} Volts RMS

5.1.6 AC Line Voltage — The IQ Data can be set to measure AC line voltage in one of two ways:

- Line-to-line — 3 Phase 3 Wire
- Line-to-neutral — 3 Phase 4 Wire

Table 5.B
PT RATIO SETTINGS

PT Ratio	SW2 Switch Settings			
	1	2	3	4
1:1 ⁽¹⁾	ON	ON	ON	ON
2:1	OFF	ON	ON	ON
4:1	ON	OFF	ON	ON
5:1	OFF	OFF	ON	ON
20:1	ON	ON	OFF	ON
30:1	OFF	ON	OFF	ON
35:1	ON	OFF	OFF	ON
40:1	OFF	OFF	OFF	ON
55:1	ON	ON	ON	OFF
60:1	OFF	ON	ON	OFF
70:1	ON	OFF	ON	OFF
100:1	OFF	OFF	ON	OFF
120:1	ON	ON	OFF	OFF
120:1	ON	ON	OFF	OFF
Any other combinations				
⁽¹⁾ Required setting when no PT used.				

Note that the settings of these potential transformers' switches allow the IQ Data to calculate and display the original, unreduced line voltage even though the level at the AC Line Connection Terminals is reduced with an external potential transformer.

5.1.7 Display Volts — The 3 AC line-to-line voltages and the 3 AC line-to-neutral voltages which appear in the Display Window are auto ranged to represent units of kilovolts or volts.

 Shaded area designates information that replaces or supplements applications using the 3-phase Power Module.

Section 6

THEORY OF OPERATION

6.0 General — This Section provides a general description of how the IQ Data functions internally. Its purpose is to give the user only an overview theory of operation.

6.1 Basic Block — The IQ Data is controlled by a self-contained microprocessor which is directed by an "executive program" resident in ROM (read-only memory). (See Figure 6.1.) The microprocessor directs the following 2 operations:

- Monitoring the AC line voltage and currents and storing their levels in a "data table" which is a solid state mem-

ory device. (The actual signals from the AC line are "conditioned" by various circuits grouped together here and referred to simply as the line interface.)

- Updating the Operator Panel on a regular basis. When a component of the Panel — such as the STEP Display pushbutton — is pressed, the executive program reacts by displaying the new information requested in the Display Window.

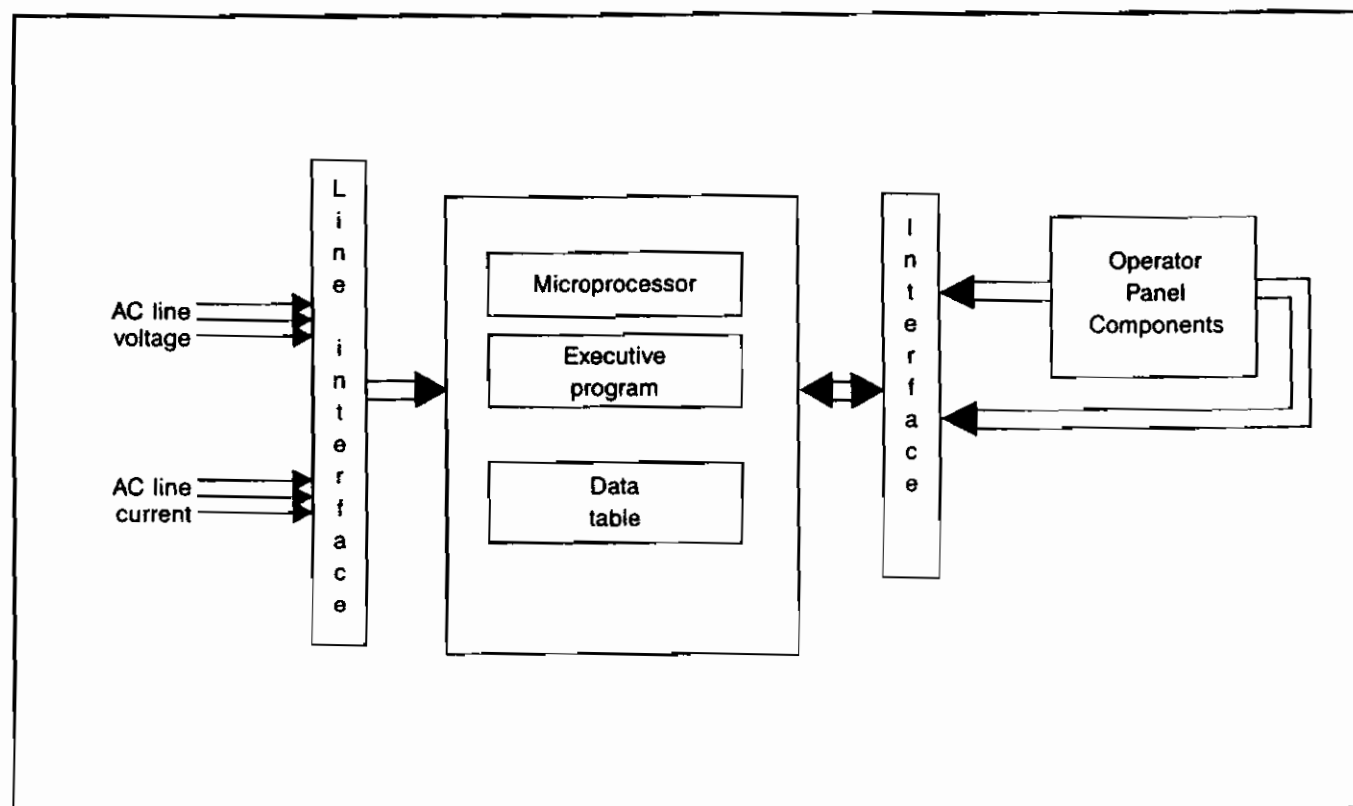


Figure 6.1 — IQ Data Basic Block

Section 7

MAINTENANCE

7.0 General — This Section describes maintenance procedures for the IQ Data. The information contained here is divided as follows:

- Isolating a malfunction (Par. 7.1)
- Replacing the IQ Data (Par. 7.2)

Earlier Sections of this Manual, especially Section 2, Hardware Description; Section 3, Operator Panel; and Section 4, Installation and Startup, should be read thoroughly to familiarize the maintenance person with the IQ Data.

Table 7.A
INITIAL POWER-ON TROUBLESHOOTING

Symptom	Probable Cause(s)	Solution
All Operator Panel indicators are off.	• Control power is deficient.	• Locate deficiency in control power line. • Replace unit. (See Paragraph 7.2)

7.1 Troubleshooting — This Paragraph describes the following procedures:

- Troubleshooting when AC power is first applied to an IQ Data in an application (Par. 7.1.1).
- Troubleshooting assuming the IQ Data has been installed and was operational for a period of time (Par. 7.1.2).

7.1.1 Initial Startup — This Paragraph lists procedures to follow when the IQ Data is not operating properly after AC power is first applied. The procedures assume that:

- All steps listed in Paragraphs 4.4.1 and 4.4.2 have been completed, and
- One or both display windows do not display values and/or the I_A AMPS RMS LED or V_{AB} VOLTS RMS LED are not lit.

— DANGER —

All maintenance procedures must be performed only by qualified personnel who are familiar with the IQ Data and the associated AC lines being monitored. Failure to observe this caution can result in serious or even fatal personal injury and/or equipment damage.

The following procedures at times involve working in equipment areas where the hazard of fatal electrical shock is present. Live parts are exposed. Personnel must exercise extreme caution to avoid injury, including possible fatal injury.

Always disconnect and, if necessary, lock out the AC power source before touching the components on the rear of the IQ Data. Failure to do so can result in serious or even fatal personal injury and/or equipment damage.

 Shaded area designates information that replaces or supplements applications using the 3-phase Power Module.

Table 7.B

Symptom	Probable Cause(s)	Solution
All Operator Panel indicators are off.	• Control power is deficient.	• Locate control power deficiency.
	• Unit is malfunctioning.	• Replace unit. (See Paragraph 7.2)

Before attempting to troubleshoot the IQ Data and the associated equipment, read and observe the Dangers listed in the box on the previous page. When the normal operational conditions of the IQ Data listed above cannot be observed, refer to Table 7.A. This Table lists a probable cause and suggests an approach for each possible symptom.

7.1.2 Operational Troubleshooting — A troubleshooting chart, shown in Table 7.B, lists the probable causes and solutions for each of a number of symptoms. This Table assumes the IQ Data has been operating properly for a period of time. Before attempting to troubleshoot the unit and its associated equipment, read and observe the Dangers listed in this Section.

7.2 Unit Replacement — Follow this procedure to replace the IQ Data.

Step 1 — Remove AC power at the main disconnect or isolation switch of the line being monitored. If the switch is located at a distance from the IQ Data, lock it out to guard against personnel accidentally turning it on.

Step 2 — Before disconnecting any wires from the unit, make sure they are individually identified to assure that reconnection will be correctly performed. Make a sketch to help with the task of terminal and wire identification.

Step 3 — If an optional module connects with the Communications Port, carefully unplug it. The connectors may be screwed together.

Step 4 — Loosen each screw terminal or nut where there is

a wire connection. Remove the associated wire.

Step 6 — Remove the 6 mounting screws holding the unit against the door or panel. These are accessed from the IQ Data's rear.

CAUTION: Be prepared to support the IQ Data from its front side once most of the screws are loosened or removed. Without such support, the unit could fall off, and the Panel could be damaged.

Step 7 — Carefully lay these screws aside for later use.

Step 8 — Read Paragraph 4.1.2 before attempting to mount the replacement unit.

Step 9 — Reverse the procedure noted in Steps 3 thru 6.

Step 10 — Using the sketch noted in Step 2, above, replace each wire at the correct terminal. Be sure each is firmly tightened.

Step 11 — Set the DIP switches on the right rear of the unit according to the individual application's Installation Record Sheet. (If necessary, see Paragraph 4.3 for details.)

Step 12 — Restore AC power and verify that the Operator Panel functions, after an initial 2-second delay, are as follows:

- The I_A AMPS RMS LED and V_{AB} VOLTS RMS LED illuminate.
- The Display Window shows the actual line phase A amperes and phase A-B voltage.



Shaded area designates information that replaces or supplements applications using the 3-phase Power Module.

Cutler-Hammer

**Westinghouse &
Cutler-Hammer Products**
Five Parkway Center
Pittsburgh, PA 15220
(412) 937-6100

CCI
Printed in U.S.A.

EATON

Instructions for Three-Phase Power Supply Module

I.L. 17285B

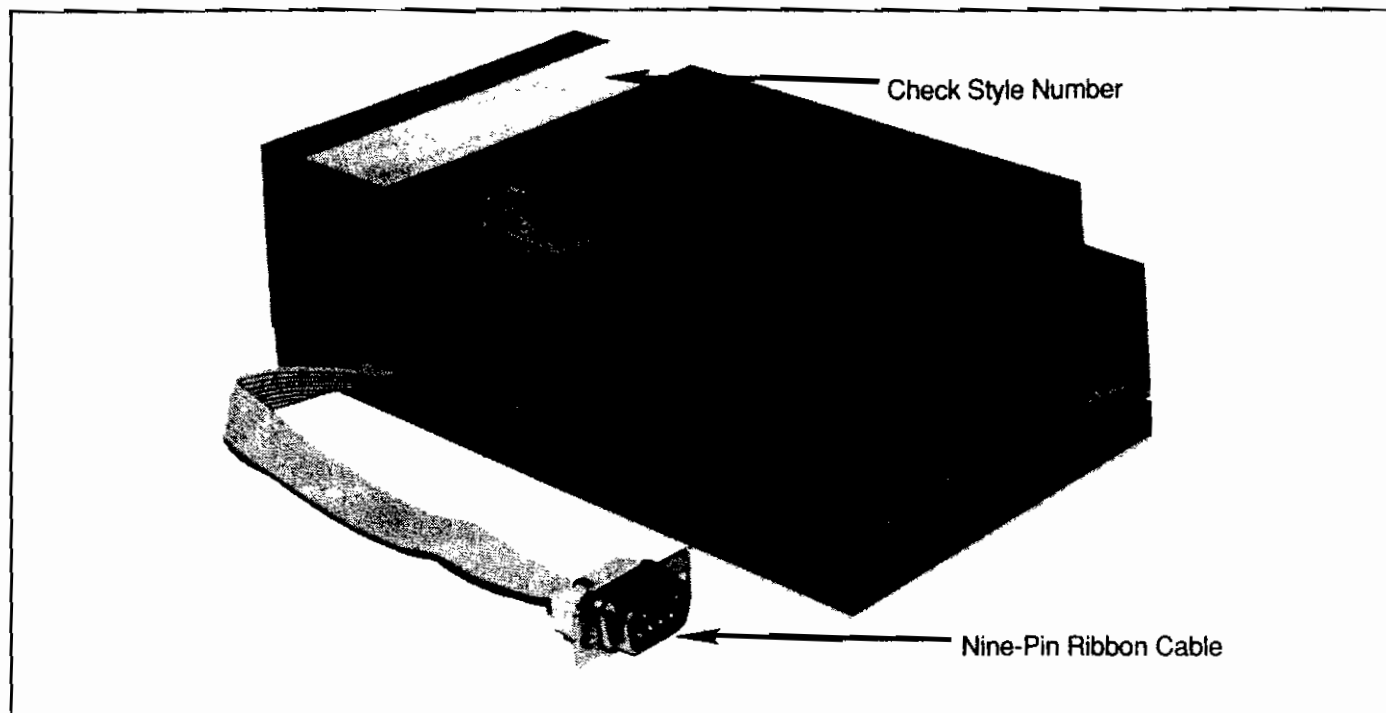


Fig. 1 Three-Phase Power Supply Module

THE MODULE

Three-phase power supply modules are offered in two styles (9966D75G01 and G02) for the specific applications shown in Table I. If a power module is used with an IQ metering device other than as shown, equipment damage will result. The appropriate power module will permit an IQ DATA, IQ GENERATOR, IQ DATA PLUS or IQ DATA PLUS II to be powered from the 50 or 60 hertz lines being monitored. The three-phase power module is used in lieu of a separate 120 or 240 VAC power supply.

VOLTAGE SWITCH

The difference between style 9966D75G01 and 9966D75G02 is the setting of the voltage switch located on the printed circuit board. See Figures 2 and 4. This switch position determines the voltage supplied to the IQ

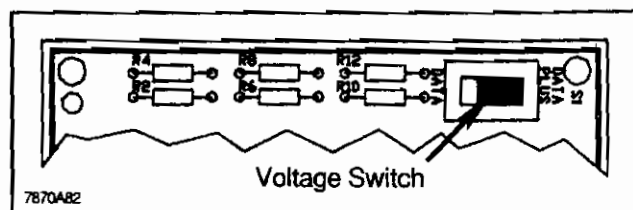


Fig. 2 Location of Voltage Switch

device via the 9-pin ribbon cable. Modules are marked with the style number corresponding to the switch position. Style number 9966D75G01 denotes the switch in the "Data Plus" position for use with the IQ Data Plus/Data Plus II/Data Plus II HV. Style number 9966D75G02 denotes the switch in the "Data" position for use with the IQ Data or IQ Generator.

TABLE I — MODULE APPLICATIONS					
Style No. 9966D75G01 is a replacement for style 5281C55G02 power module.			Style No. 9966D75G02 is a replacement for style 5281C55G03 power module.		
Style No. 9966D75G01 may also be used with:			Style No. 9966D75G02 may also be used with:		
IQ Metering Device		Style No. with Power Module Originally	IQ Metering Device		Style No. with Power Module Originally
IQ DATA PLUS		9966D38G01	IQ DATA		2D78533G03
IQ DATA PLUS II		2D78522G01	IQ GENERATOR		2D78533G04
IQ DATA PLUS II HV		2D78544G01			Style No. w/o Power Module Originally
					2D78533G01
					2D78533G02

THREE-PHASE POWER SUPPLY MODULE

I.L. 17285B

VOLTAGE SWITCH (cont.)

NOTE: Switch position should NOT be changed from the factory setting. Switch setting changes void the validity of the style number and may damage unit.

INSTALLATION

This device is designed to be installed, operated, and maintained by adequately trained workmen. These instructions do not cover all details, variations, or combinations of the equipment, its storage, delivery, installation, check-out, safe operation, or maintenance. Care must be exercised to comply with local, state, and national regulations, as well as safety practices, for this class of equipment.

REMOVING EXISTING POWER MODULE

If an existing power supply module is being replaced, disconnect all power to the IQ metering device including power to the relay contacts of the metering device where applicable. Label and remove each wire connected to the old power module. Unscrew the plug lock assembly (see Figure 3) on the ribbon cable to the IQ metering device and disconnect the cable plug. Remove the two mounting screws that hold the power module in position.

CAUTION: Be prepared to support the power module once the screws have been removed.

MOUNTING TO AN IQ METERING DEVICE

Use two mounting screws to attach the power module to

the back of the IQ device as shown in Figure 3. Connect terminals A, B, C and NEU to the three-phase lines and neutral being monitored under the feeder tap rules of Article 240, National Electrical Code. Insert the ribbon cable plug into its receptacle and tighten the plug lock screws.

REMOTE MOUNTING

The three-phase power supply module may be panel mounted separate from the IQ metering device by using the 36-inch long extension cable 7871A40G02 (cable must be ordered separately) which has a plug at one end and a socket at the other. Use the power module as a drilling template for the two #8-32 mounting screws. Complete the electrical connections as described above.

FUSES

The three-phase power supply module is supplied with three Class CC primary fuses rated 3/4 ampere, 600 VAC as shown in Figure 4. These current-limiting fuses have an interrupting rating of 200,000 amperes, rms symmetrical.

The transformer secondary is protected by one .5 ampere fuse with an interrupting rating of 10,000 amperes.

Remove the three cover screws to gain access to the fuses.

REPLACEMENT FUSES

Primary: Class CC, Type KTK-R-3/4, or equivalent.

Secondary: Very-fast Littlefuse #273-500, or equivalent.

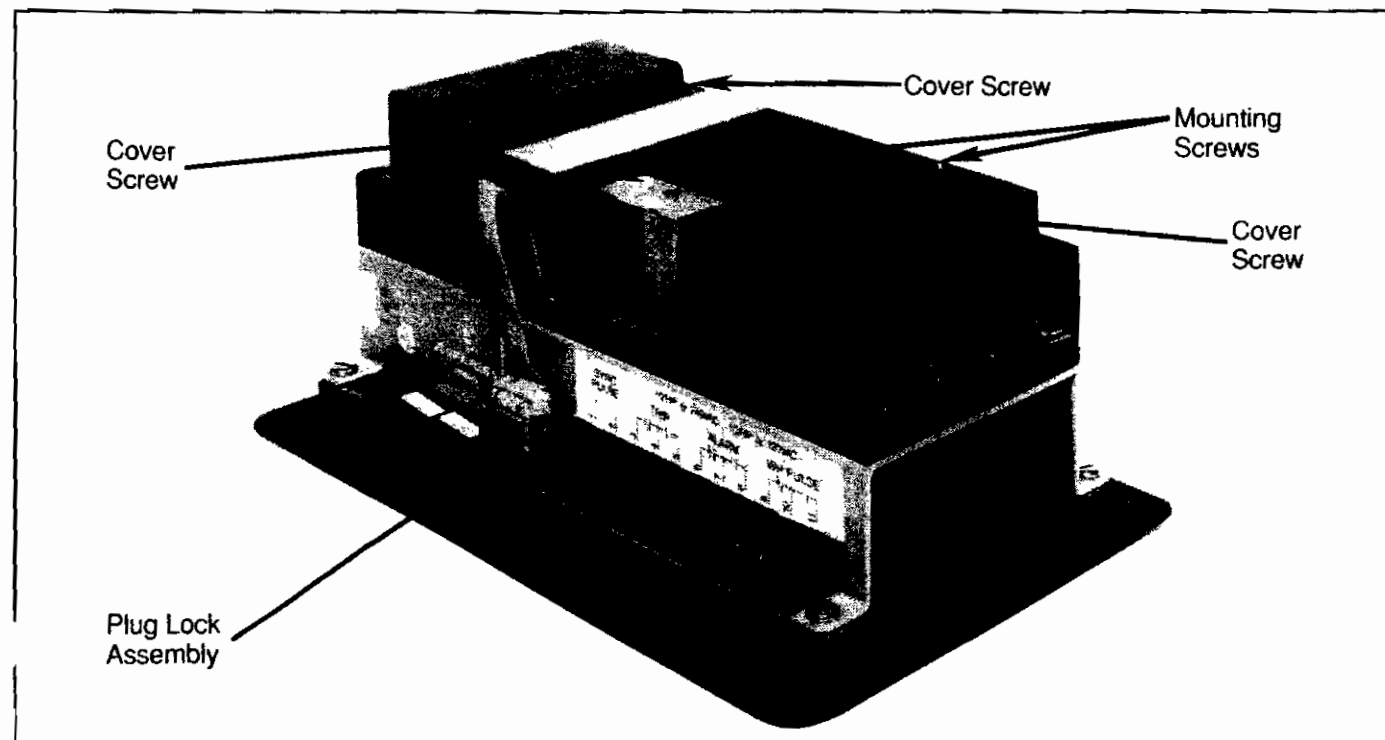


Fig. 3 Three-Phase Power Supply Module Mounted on an IQ DATA PLUS II

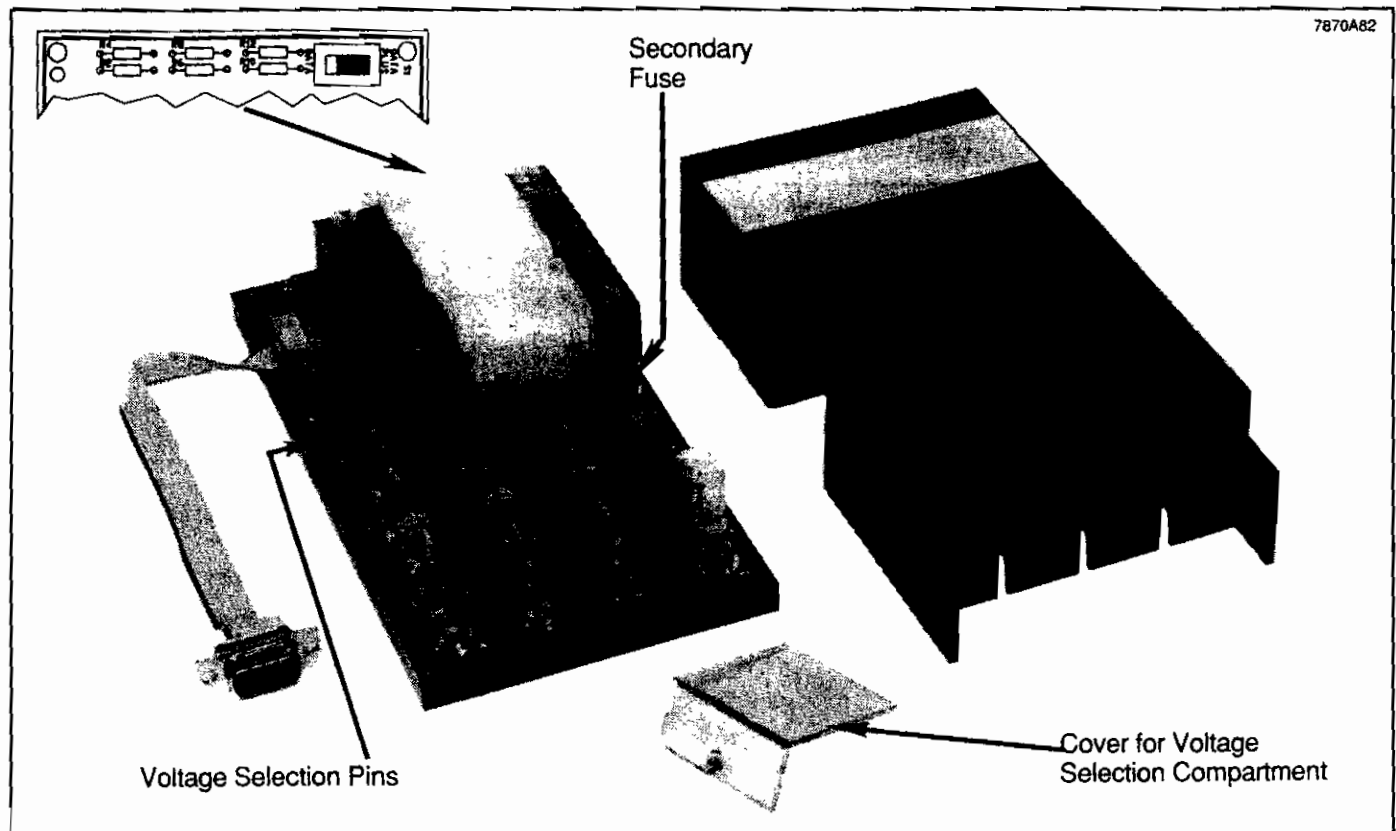


Fig. 4 Three-Phase Power Supply Module with Covers Removed

WARNING

Failure to disconnect the module and its associated metering device prior to installation or changing jumpers or fuses may result in severe injury or death.

VOLTAGE SELECTION JUMPER (PINS)

Input to the three-phase power supply module must be limited to not more than 600 volts, nominal. For lines at higher voltages use a step-down potential transformer. Insert the jumper located in the voltage selection compartment at the voltage to be supplied to the module:

DESIGNATION	VOLTAGE RANGE
460/575 V	425 to 660 VAC
380/415 V	270 to 432 VAC
208/220/240 V	170 to 272 VAC
120 V	96 to 154 VAC

Those pins not covered by the jumper are live parts when the power module is energized!

Keep the cover for the voltage selection compartment in place with the #4-40 flat head screw supplied whenever the module is energized.

OPERATION CHECK

After installing the power module, completing all the electrical connections and replacing covers, apply power and check the IQ metering device for proper operation.

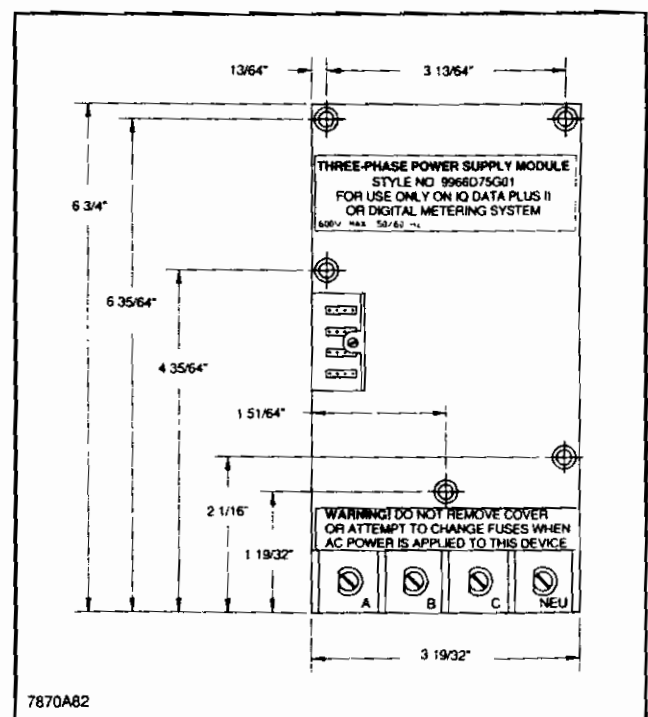


Fig. 5 Screw Locations

RECOMMENDED CONNECTIONS

Use copper conductors only.
#14 AWG Red or Black for AC
Tighten to 7 lb.-in.

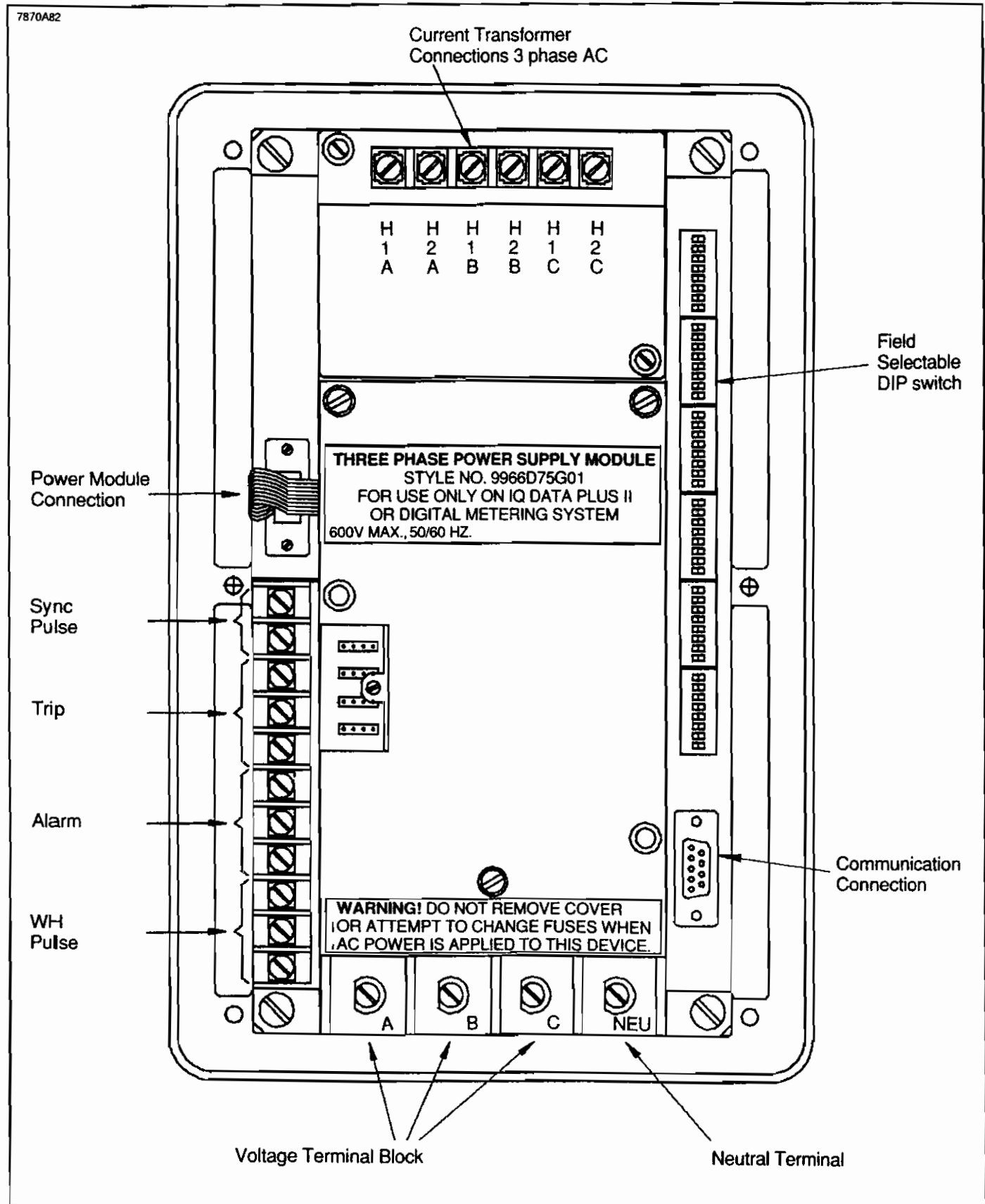


Fig. 6 IQ DATA PLUS II with Three-Phase Power Supply Module Installed

SECTION E5
FIRE AND INTRUSION ALARM SYSTEM

PROJECT:

Niagara County Refuse

Fire and Intrusion Alarm System

ELECTRICAL CONTRACTOR:

CIR Electrical Construction, Inc.

2750 Kenmore Ave.

Tonawanda, N.Y. 14150

SYSTEM SUPPLIER:

Life Safety Engineered Systems, Inc.

25 Tyrol Dr.

Cheektowaga, N.Y. 14227

CIR ELECTRICAL CONSTRUCTION CORP.

HAS EXAMINED THIS SUBMITTAL FOR CONFORMANCE WITH THE DESIGN CONCEPT OF THE PROJECT AND COMPLIANCE WITH THE PROJECT SPECIFICATIONS AND DRAWINGS.

PROJECT _____

ITEM _____

SPEC. SECTION _____

BY _____ DATE _____

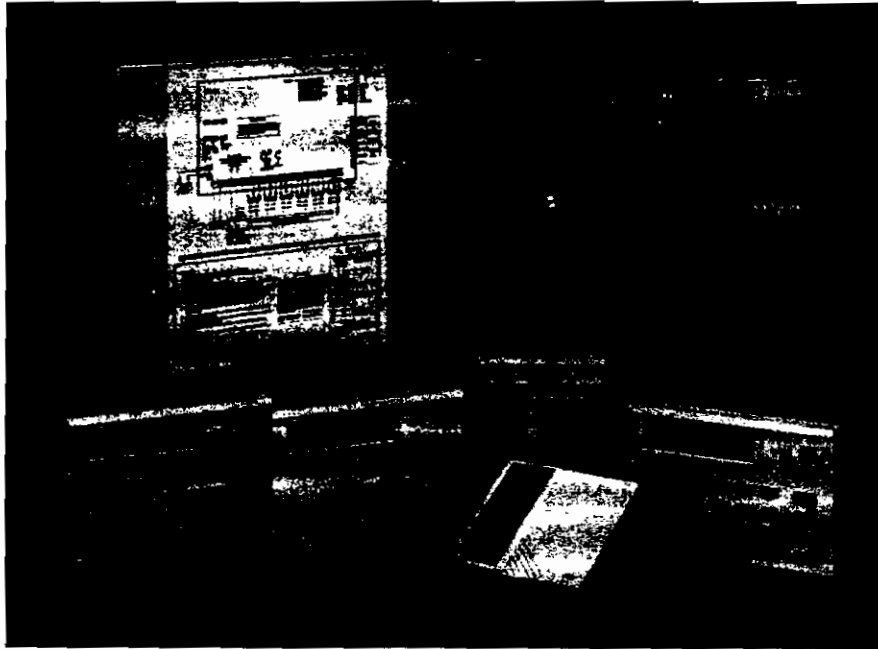
NIAGARA COUNTY REFUSE

SECURITY SYSTEM

BILL OF MATERIAL

<u>QTY</u>	<u>Model Number</u>	<u>Description</u>
1	FBII XL-31	CONTROL PANEL
1	7015	LED KEYPAD/ SWITCH
3	1085T	DOOR CONTACTS
2	2412THB	SMOKE HEAT DETECTOR
1	IM-1240	12VOLT, 4AH BATTERY

S P E C I F I C A T I O N S



XL-31 system shown with compatible keypads XL-4612RM, XL-4612SM, 7015, 7005L, and 7005.

XL-31



12 Zone EEPROM Control/Communicator

STANDARD FEATURES:

- 12 fully programmable zones
- Keypad and remote programming
- Upload/download/remote commands with answering machine detection
- Built in two channel siren driver
- Auto arming feature
- Access code triggers (door strike) capability
- 30 user codes
- Fast loop response option
- Swinger shut down
- Choice of LCD or LED keypads
- True low battery and no battery testing
- Phone line cut detection
- Four programmable trigger outputs
- Four selectable keypad emergency conditions
- Cancel report option
- Quick arming and quick forced arming options
- Default lockout option to prevent hostile account takeovers
- Enhanced auto test reporting option
- Enclosure dimensions
 - 12.5 x 14.5 x 3 (model XL-31)
 - 14.5 x 18 x 4.3 (model XL-31B)

SYSTEM COMPONENTS

XL-31	Twelve zone EEPROM based Control Communicator featuring keypad programming, remote uploading/downloading/commands with built in siren driver. Includes control panel and transformer; keypads available separately.	XL-4612SM	Plastic surface mount LED keypad. Features backlit keys concealed behind door; Includes both a smoked glass and white door.
XL-31LT	Same as XL-31 less transformer	7015	LED keypad featuring individual LEDs for zone system status, with illuminated keys.
XL-31B	Twelve zone EEPROM based Control Communicator suitable for UL commercial (mercantile) installations. Includes transformer; keypads available separately.	7005	LCD based keypad (featuring 2 line by 16 character backlit supertwist display and illuminated keys).
XL-4612RM	Metal plate LED based keypad. Can be recessed mounted or surface mounted (with optional XL-4600RMBX backbox). NOTE: XL-4612RM or XL-4612SM keypad cannot be mixed with other style keypads on the same system.	7005L	LCD based keypad featuring large character display
		XL-4600RMBX	Back box for surface mounting the XL-4612RM keypad.

XL - 31 SPECIFICATIONS

PROGRAMMING

- On-site programming directly through keypad (LED or LCD)
- Remote programming through PC Downloader (7700)
- Installer code prevents unauthorized keypad programming
- Optional default lockout feature prevents default from overwriting CSID and installer code, option to inhibit keypad programming
- Customized zone descriptors through LCD keypads or PC downloader

ADDITIONAL FEATURES

- Installer walk test feature
- Auto arming feature at specific time of day
- Real time clock with reminder when time needs to be reset
- History log retains the past 6 zone alarms/troubles, viewable through keypad by installer, or from alarm company
- Chime on/off feature through keypad
- Keypad tamper function with optional CS transmission
- Phone line cut detection with audible/silent output
- Swinger shutdown option

OUTPUTS

- Four voltage level output triggers programmable as follows: User code entry (Door strike application) arming status, ready status, bypass, exit, entry, stay, instant, AC loss, low battery, burglar alarm, fire panic duress, keypad tamper, keypad fire, keypad aux., trouble, fire trouble, day trouble, alarm memory, fail to communicate, sounder, phone failure, ground start
- Note:** Only three triggers available if fast response loop option is selected

ZONES

- Twelve fully programmable zones, each selectable for EOL supervision, NO or NC devices
- Fast loop response zone option (7 msec)
- Four Emergency keypad conditions (Fire, Panic, Aux, Duress)
- Versatile Zone types:
Controlled Zone types include: Instant, Exit/Entry, Interior, Day, and Keyswitch, with options for Dialer Delay, Restore and Chime by zone. 24 Hour Zone Types include: Fire, Burglary, Silent, Trouble, Medical
- Programmable central station reporting codes per zone
- Individual reporting codes for *Ambush, Panic, AC Loss, 24 Hour Test, Low Battery, Open, Close, Trouble, Restore*
- Bell Test option, Smoke reset and verification features
- Separate bell cutoff times for *BURG* and *FIRE* bell
- Programmable entry and exit times, and bell lockout feature

REMOTE OPERATIONS

- Secure remote communications with security codes and optional callback method
Download/Upload remotely even in the presence of answering machines
- Remote commands include: *Arm/Forced Arm, Disarm, Bypass* zones, change user codes, read system status.

- Remote operations can be performed through the EZ-Mate PC Downloader (7700)
- Answering machine override on one phone call

USER CODES

- Thirty user codes, keypad programmable by master user
- Options for *Arm only, Ambush, and Door Strike* user codes
- Open/Close by user ID
- Unique O/C codes for all users within 4 x 2 format, expanded, FBI Superfast, or Point ID formats.

CENTRAL STATION COMMUNICATIONS

- Dual Central Station telephone numbers
- Two CS account numbers (3 or 4 digits)
- Pulse or touch tone dialing option
- Transmission speeds include 10PPS, 20PPS, 40PPS with or without parity
- Formats include: 3x1, 4x1, 4x2, Expanded, Single Round Expanded
- FBI Superfast, Ademco Express 4x1 and 4x2 Formats, Ademco Point ID Format
- Split reporting option for openings and closings
- Sonalert ringback feature
- Test options include daily, weekly, 27, 60 or 90 day intervals, test by time, event or event/time

KEYPADS

- Up to 4 keypads per system, easy to install 4 wire devices
 - Individual LEDs show status of each zone with indications of ALARM, TROUBLE BYPASS and NOT READY conditions [LED keypads include XL-4612RM*, XL-4612SM*, 7015]
 - Indicators display current system status (ARMED, READY, STAY, INSTANT, AC/Low Battery) [LED based keypads]
 - English readout keypad displays system status in 2 line by 16 character readout; customized 12 character zone descriptors (LCD keypads include 7005 and 7005L)
- *Note:** The XL-4612RM or XL-4612SM keypads cannot be mixed with other keypads on the same system.

POWER SPECIFICATIONS

- Watchdog Circuitry insures integrity of microprocessor
- Total Aux. power: 500 mA. regulated
- Transformer 16.5V 40 VA, Bell Power: 1 Amp

LISTINGS

- UL Household Combination Burglary/Fire (XL-31)
- UL Mercantile Burglary Listing: Local Grade A, Police Connect Grade A, Grade AA, Central Station Grade B (XL-31B)
- California State Fire Marshal (CSFM)



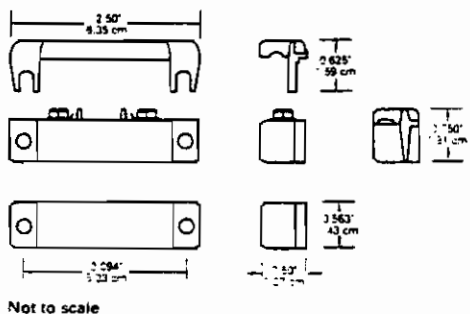
A Subsidiary of Pittway Corp.
149 Eileen Way, Syosset, NY 11791
800-645-5430 • 516-921-8666

1085T Series

Screw Terminal



- Ideal for residential and commercial
- Easy clamping terminals speed installation
- Convenient surface mounting
- Built-in resistors available; consult factory
- Cover, spacer, screws included

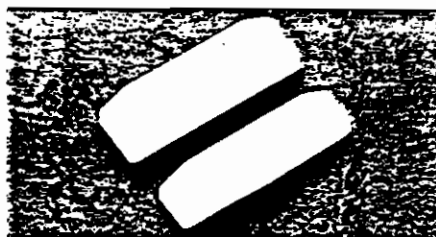


ORDERING INFORMATION	Gap Size	Closed Loop	Open Loop	S.P.D.T.	Lead Type
Regular Gap Series  	3/4" (w/1081T magnet)	1085T	1086T	1087T	#6 Screw Terminal
Wide Gap Series  	1 1/2" (w/1081T magnet)	1085TW	1086TW	1087TW	#6 Screw Terminal
Long Gap Series  	1" (w/1080T magnet)	1082T	1083T	1084T	#6 Screw Terminal
Extra Wide Gap Series  	2" (w/1080T magnet)	1082TW	1083TW	1084TW	#6 Screw Terminal
Biased for Higher Security Applications 	3/8" to 1 1/4" (w/1080T magnet)			1087TH	#6 Screw Terminal

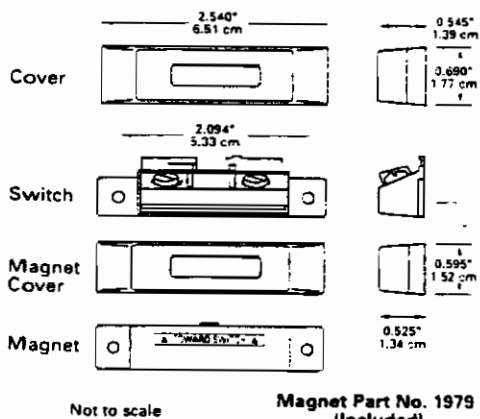
NOTE: Specify natural, grey or mahogany brown.
Selected models available in white.
For Accessories, see pages 164-169.
Protected by U.S. Patent 4,271,898.

1285T Series

Designer Styled With Screw Terminals



- Ideal for residential and commercial
- Convenient surface mounting; combo head screws for quick termination
- Modern, low-profile design
- Private labeled, snap-on cover
- Angled clamping terminals for fast and easy lead connection



ORDERING INFORMATION	Gap Size	Closed Loop	Open Loop	S.P.D.T.	Lead Type
Regular Gap Series  	3/4" (w/1979 magnet)	1285T	1286T	1287T	#6 Screw Terminal
Wide Gap Series  	1 1/2" (w/1979 magnet)	1285TW	1286TW	1287TW	#6 Screw Terminal
Extra Wide Gap Series  	2" (w/1975 magnet)	1282TW	1283TW	1284TW	#6 Screw Terminal

NOTE: Specify white or mahogany brown.
For Accessories, see page 164.



A Pittway Company

June 22, 1998

I-120

2412 and 2424

4-Wire Photoelectric Smoke Detectors with Optional Horn & Thermal Sensors

Section: Conventional Initiating Devices

GENERAL

The System Sensor 2400 Series photoelectric detector is specifically designed to meet the stringent performance requirements of industrial and municipal fire detection and alarm systems. The design of these detectors emphasizes ease of installation and field maintenance.

FEATURES

- 12 or 24 VDC operation
- Unique optical sensing chamber:
 - Superior signal-to-noise ratio.
 - Built-in signal processing.
 - 3.0% nominal sensitivity.
- Removable cover for field cleaning.
- Visible LED "blinks" in standby, latches on in alarm.
- Sealed against dirt, insects, and back pressure.
- Optional built-in 135°F (57°C) thermal.
- Three-year limited warranty.
- Field metering of detector sensitivity.
- Built-in test capability.
- Low standby current.
- Twist-on mounting bracket with tamper option.
- Designed for direct surface or electrical box mounting.
- Models available with built-in 85 dBA piezoelectric horn.
- Insect-resistant screening with 0.020" (0.508 mm) openings.
- Isolated or integrated operation of thermal available (certain models).
- SEMS screws for easy wiring.
- Meets performance criteria designated by UL 268.
- Built to withstand air velocities up to 3,000 feet (914.4 meters) per minute without triggering a false alarm.

APPLICATIONS

Use to contribute to life safety, fire protection, and property conservation. Photoelectric detectors are recommended in areas where smoldering fires are likely to ignite. In areas where small combustion particles are usually present from forklift trucks, cooking stoves, etc., they are less likely than ionization detectors to produce false alarms.

For further information, see System Sensor manual I56-407-03, "Applications Manual for System Smoke Detectors," which provides detailed information on detector spacing, placement, zoning, wiring, and special applications.



S911



CS308



California
State Fire
Marshal

7257-1209:103
7257-1209:134

MEA

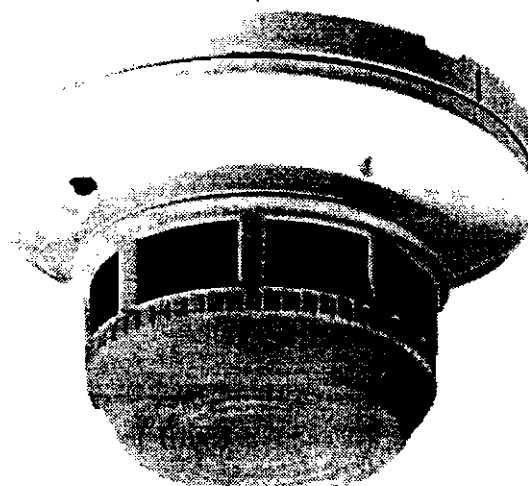
427-91-E Vol. III
(2412AT, 2424, 2424AIT,
2424AT, 2424TH)



0Q6A1.AY

BSA

1329-88-SA
(2424AIT, 2424AT)
1346-88-SA
(2412B, 2412THB,
2424, 2424TH)



CONSTRUCTION AND OPERATION

All 2400 Series photoelectric smoke detectors contain a unique optical sensing chamber designed to sense the presence of smoke particles produced by a wide range of combustion sources. A custom integrated circuit incorporates signal processing to reduce false alarms and sample/hold circuitry to provide easy field metering of sensitivity.

The optional built-in piezo horn produces an interrupted 85 dBA tone at 10 feet (3.048 m). The horn operates upon polarity reversal of the supply voltage, when the unit senses smoke, or when the thermal reaches its alarm point (integral thermal models only).

This document is not intended to be used for installation purposes. We try to keep our product information up-to-date and accurate. We cannot cover all specific applications or anticipate all requirements. All specifications are subject to change without notice. For more information, contact NOTIFIER. Phone: (203) 484-7161 FAX: (203) 484-7118



12 Clintonville Road, Northford, Connecticut 06472

ISO-9001

Engineering and Manufacturing
Quality System Certified to
International Standard ISO-9001



Made in the U.S.A.



NOTIFIER®

A Pittway Company

May 14, 1998

E-200

PS Series Batteries

Section: Power Supplies

GENERAL

Power-Sonic PS Series batteries provide secondary power for the whole series of NOTIFIER fire alarm control panels.

FEATURES

- Provide secondary power for control panels.
- Gelled electrolyte.
- Sealed and maintenance-free.
- Overcharge protected.
- Extended shelf life.
- Easy handling with leakproof construction.
- Ruggedly constructed, high-impact ABS plastic case.
- Long service life.
- Compact design.

CAPACITY

Battery capacity, expressed in ampere-hours (AH), is the product of a discharge current and the length of time that the current is discharged. Batteries are rated according to their performance during 20 hours of discharge at a constant current.

The rated capacity of a battery is determined by subjecting it to a constant discharge current for 20 hours at 68°F (20°C). After 20 hours the voltage across the terminals is measured. The discharge current which causes a reading of 1.72 volts per cell (5.16 V on a 6 V battery and 10.32 V on a 12 V battery) is called the rated current. This current multiplied by 20 is the rated capacity of the battery.

APPLICATIONS

Use the PS Series batteries to provide backup power for control panels. Select batteries based on current requirements for your system and the capacity of its charger. These batteries can be used over a temperature range of -76°F to +140°F (-60°C to +60°C).

CONSTRUCTION

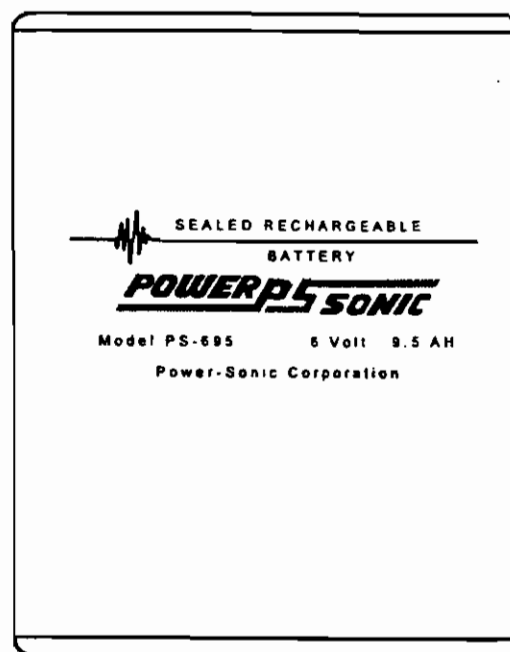
The sealed construction of the Power-Sonic battery allows trouble-free, safe operation in any position. There is no need to add electrolyte, as gases generated during overcharge are recombined in a unique "Oxygen Cycle." The battery is sealed, leakproof, and maintenance-free. The case is made of ABS, a high-impact plastic resin (acrylonitrile butadiene styrene copolymer) with high resistance to chemicals and flammability.

INSTALLATION

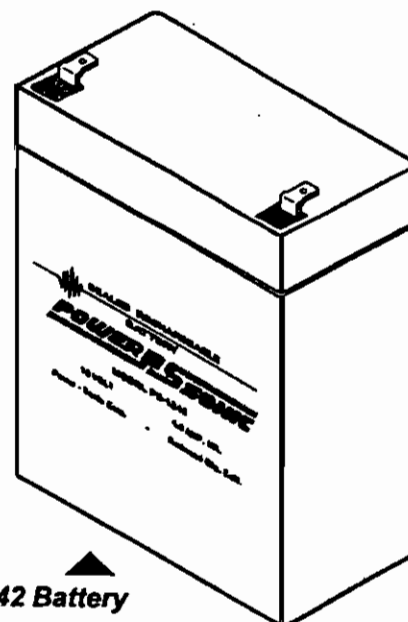
All panels have space reserved for batteries. See the appropriate panel installation manual for battery size restrictions. Typical inter-connection diagrams are shown in the literature accompanying each control panel.



MH14328 (S)



▲ The PS-695 Battery



▲ The PS-1242 Battery

This document is not intended to be used for installation purposes. We try to keep our product information up-to-date and accurate. We cannot cover all specific applications or anticipate all requirements. All specifications are subject to change without notice. For more information, contact NOTIFIER. Phone: (203) 484-7161 FAX: (203) 484-7118



NOTIFIER®

12 Clintonville Road, Northford, Connecticut 06472

ISO-9001

Engineering and Manufacturing
Quality System Certified to
International Standard ISO-9001

SECTION E6
ELECTRICAL APPARATUS/DEVICES

SUBMITTAL COVER

PARSONS ENGINEERING SCIENCE, INC. PROJECT NO.

733549.10100

CONTRACTOR:

HASELEY CONSTRUCTION COMPANY, INC.

ADDRESS:

10315 LOCKPORT ROAD, NIAGARA FALLS, NY 14304

PROJECT:

NIAGARA COUNTY REFUSE SITE

SUBMITTAL NO:

49H

DATE OF SUBMITTAL:

01/28/99

TYPE OF SUBMITTAL (CHECK ONE)



Product Data



Schedule



Performance Data



Sample



Warranty



Operations & Maintenance Data



Color Selection



Test Report



Record Document

DESCRIPTION OF SUBMITTAL:

Product Name:

ELECTRICAL UNIT HEATER

Manufacturer:

MARKEL

Subcontractor/Supplier:

CIR ELECTRICAL CONSTRUCTION CORP.

Section No.(s):

16000

Drawing No.(s):

Part/Paragraph:

2.6

Detail Reference:

ENGINEER'S APPROVAL

SUBMITTAL REVIEWED SOLELY
FOR GENERAL COMPLIANCE
WITH CONTRACT DOCUMENTS

DATE/BY

2-2-99 KS REVIEWED

REVIEWED AS NOTED

FABRICATION/INSTALLATION/PRODUCTION
MAY PROCEED.

REVISE AND RESUBMIT

REJECTED

FABRICATION/INSTALLATION/PRODUCTION
MAY NOT PROCEED.

PARSONS ENGINEERING SCIENCE

CONTRACTOR'S APPROVAL STAMP

NIAGARA COUNTY REFUSE SITE
HASELEY CONSTRUCTION CO., INC.

Date: 1/28/99

Item: ELECTRICAL UNIT HEATER

Specification: ELECTRICAL

Section: 16000 Para. No. 2.6

Drawing No.: Page No. 7

Location: NCS Submittal No. 49H
APPROVED BY: WILLIAM L. BEY

RECEIVED STAMPS

RECEIVED

APR 5 1999

KS

SPECIFICATIONS TABLE 1

SECTION I ELECTRICAL DATA

SECTION II

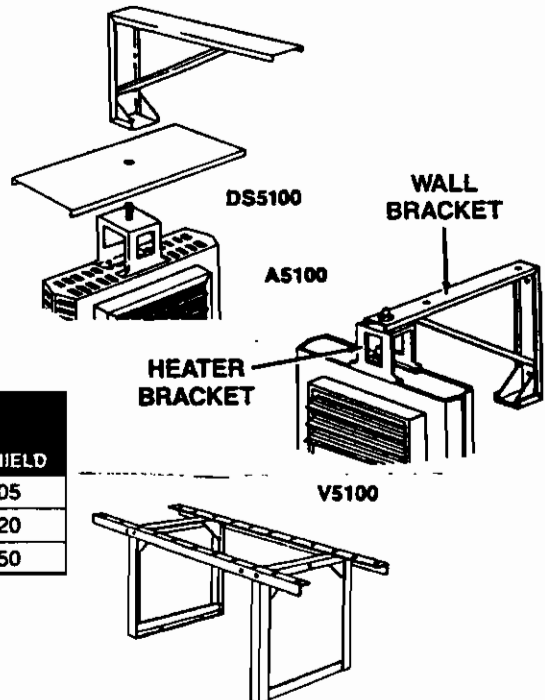
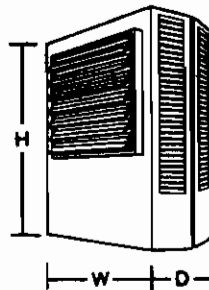
MOTOR DATA

AIR DELIVERY DATA

CATALOG NUMBER	KW RATING	BTU/HR (800)	HEATER VOLTAGE	#	STD. CONTROL VOLTAGE	MAX. AMP RATING	VOLTAGE	H.P.	R.P.M.	CFM @ OUTLET	FPM @ OUTLET	F° AIR RISE @ OUTLET	HORIZONTAL AIR THROW FT	RECOMMENDED MAX. MOUNTING HEIGHT HORIZONTAL	RECOMMENDED MAX. MOUNTING HEIGHT VERTICAL
+ F1F5103N	3.3	11.2	208	1	208	15.9	208	1/125	1550	400	1030	26°	12'	9'	9'
+ HF1B5103N	3.3/2.5	11.2/8.5	240/208	1	240/208	13.7/11.9	240/208	1/125	1550	400	1030	26°	12'	9'	9'
+ F2F5103N	3.3	11.2	208	1	208	15.9	208	1/125	1550	400	1030	26°	12'	9'	9'
			208	3	208	9.2	208	1/125	1500	400	1030	26°	12'	9'	9'
+ HF2B5103N	3.3/2.5	11.2/8.5	240/208	1	240/208	13.7/11.9	240/208	1/125	1550	400	1030	26°	12'	9'	9'
			240/208	3	240/208	7.9/6.9	240/208	1/125	1500	400	1030	26°	12'	9'	9'
+ G1G5103N	3.3	11.2	277	1	277	11.9	277	1/125	1550	400	1030	26°	12'	9'	9'
P3P5103CA1N	3.3	11.2	480	3	24	4.0	480	1/125	1550	400	1030	26°	12'	9'	9'
+ F1F5105N	5.0	17.1	208	1	208	24.1	208	1/125	1550	400	1030	40°	12'	9'	9'
+ HF1B5105N	5.0/3.7	17.1/12.8	240/208	1	240/208	20.9/18.1	240/208	1/125	1550	400	1030	40°	12'	9'	9'
+ F2F5105N	5.0	17.1	208	1	208	24.1	208	1/125	1550	400	1030	40°	12'	9'	9'
			208	3	208	13.9	208	1/125	1550	400	1030	40°	12'	9'	9'
+ HF2B5105N	5.0/3.7	17.1/12.8	240/208	1	240/208	20.9/18.1	240/208	1/125	1550	400	1030	40°	12'	9'	9'
			240/208	3	240/208	12.1/10.4	240/208	1/125	1550	400	1030	40°	12'	9'	9'
+ G1G5105N	5.0	17.1	277	1	277	18.1	277	1/125	1550	400	1030	40°	12'	9'	9'
P3P5105CA1N	5.0	17.1	480	3	24	6.1	480	1/125	1550	400	1030	40°	12'	9'	9'
F2F5107CA1L	7.5	25.6	208	1	24	36.1	208	1/50	1550	700	1000	34°	22'	10'	12'
			208	3	24	20.8	208	1/50	1500	700	1000	34°	22'	10'	12'
HF2B5107CA1L	7.5/5.6	25.6/19.2	240/208	1	24	31.3/27.1	240/208	1/50	1550	700	1000	34°	22'	10'	12'
			240/208	3	24	18.1/15.6	240/208	1/50	1500	700	1000	34°	22'	10'	12'
G1G5107CA1L	7.5	25.6	277	1	24	27.1	277	1/50	1550	700	1000	34°	22'	10'	12'
P3P5107CA1N	7.5	25.6	480	3	24	9.1	480	1/50	1550	700	1000	34°	22'	10'	12'
F2F5110CA1L	9.9	33.8	208	1	24	47.8	208	1/50	1550	700	1000	45°	22'	10'	14'
			208	3	24	27.7	208	1/50	1550	700	1000	45°	22'	10'	14'
HF2B5110CA1L	10.0/7.5	34.1/25.6	240/208	1	24	41.2/36.1	240/208	1/50	1550	700	1000	45°	22'	10'	14'
			240/208	3	24	24/20.8	240/208	1/50	1550	700	1000	45°	22'	10'	14'
G1G5110CA1L	10.0	34.1	277	1	24	36.1	277	1/50	1550	700	1000	45°	22'	10'	14'
P3P5110CA1N	10.0	34.1	480	3	24	12.1	480	1/50	1550	700	1000	45°	22'	10'	14'
F3F5115CA1L	15.0	51.2	208	3	24	41.7	208	1/20	1550	1100	1580	43°	32'	11'	20'
HF3B5115CA1L	15.0/11.2	51.2/38.4	240/208	3	24	36.1/31.3	240/208	1/20	1550	1100	1580	43°	32'	11'	20'
P3P5115CA1N	15.0	51.2	480	3	24	18.1	480	1/20	1550	1100	1580	43°	32'	11'	20'
HF3B5120CA1L	19.7/14.8	67.2/50.5	240/208	3	24	47.8/41.1	240/208	1/20	1550	1100	1580	57°	32'	12'	18'
P3P5120CA1N	20.0	68.3	480	3	24	24.1	480	1/20	1550	1100	1580	57°	32'	12'	18'
F3F5125CA1L	25.0	85.3	208	3	24	69.5	208	1/12	1550	2000/1800	1300/1100	40/44°	45'	12'	22'
HF3B5125CA1L	25.0/18.7	85.3/64.0	240/208	3	24	60.2/52.1	240/208	1/12	1550	2000/1800	1300/1100	40/44°	45'	12'	22'
P3P5125CA1N	25.0	85.3	480	3	24	30.1	480	1/15	1550	2000/1800	1300/1100	40/44°	45'	12'	22'
F3F5130CA1L	30.0	102.4	208	3	24	83.4	208	1/12	1550	3100/2800	2000/1800	47/53°	40'	12'	20'
HF3B5130CA1L	30.0/22.5	102.4/76.8	240/208	3	24	72.3/62.5	240/208	1/12	1550	3100/2800	2000/1800	47/53°	40'	12'	20'
P3P5130CA1N	30.0	102.4	480	3	24	36.2	480	1/15	1550	3100/2800	2000/1800	47/53°	40'	12'	20'
F3F5140CA1L	40.0	136.5	208	3	24	111.2	208	1/4	1550	3100/2800	2000/1800	40/45°	55'	15'	24'
HF3B5140CA1L	40.0/30.0	136.5/102.4	240/208	3	24	96.4/83.4	240/208	1/4	1550	3100/2800	2000/1800	40/45°	55'	15'	24'
P3P5140CA1N	39.0	133.1	480	3	24	47.0	480	1/5	1550	3100/2800	2000/1800	49/45°	55'	15'	24'
F3F5150CA1L	49.6	169.3	208	3	24	139.0	208	1/4	1550	3100/2800	2000/1800	51/56°	50'	15'	22'
HF3B5150CA1L	50.0/37.5	170.6/128.0	240/208	3	24	120.5/104.3	240/208	1/4	1550	3100/2800	2000/1800	51/56°	50'	15'	22'
P3P5150CA1N	50.0	170.6	480	3	24	60.3	480	1/5	1550	3100/2800	2000/1800	51/56°	50'	15'	22'
U3H51*	5 to 50		600	3	240		240		ALL 600 VOLT HEATER MOTOR DATA IS THE SAME AS 240 VOLT UNITS OF REQUIRED KW RATING						

DIMENSIONAL DATA

	H	W	D	SHIP WT. LBS.
3.3 and 5.0 KW	17 1/4	14 1/32	6 1/2	27
7.5 and 10.0 KW	24 9/16	21 1/2	6 1/2	50
15.0 and 20.0 KW	28 1/16	21 1/2	6 1/2	65
25.0 thru 50.0 KW	34	29 1/4	10 1/16	120

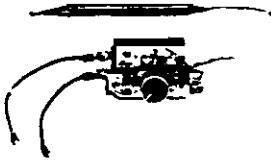


MOUNTING BRACKETS and DUST SHIELD

USED ON	HORIZONTAL HEATER AND WALL BRACKETS	HEATER BRACKET ONLY	VERTICAL	DUST SHIELD
3.3 KW to 5.0 KW	A5105	B5105	V1505	DS5105
7.5 KW to 20.0 KW	A5120	B5105	V1520	DS5120
25.0 KW to 50.0 KW	A5150	B5150	V1550	DS5150

NIAGARA COUNTY REFUSE
 UNIT HEATER
 in ar P3P5105 CAIN
 A5105 - TFS5102

Control Options



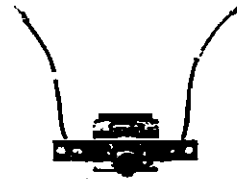
Built-In Thermostat

Single Pole, Double Pole or Two Stage Thermostats as required, 45°F-90°F Range. Models, T5100, T5102, T5122 respectively; Single pole line and low voltage stratification thermostat as required, 70°F-130°F Range. Models TC5102 and TC5103 respectively (See Table 2 for specifications)



Built-In Power Disconnect Switch

Two or Three Pole Power Disconnect Switch. 25 amp thru 100 amp AC resistive as required. (See Table 2 for specifications and model numbers).



Built-In Summer Fan Switch

Summer Fan Switch for independent fan operations as required. (See Table 2 for specifications and model numbers.)

TABLE 2 Field Installed Heater Mounted Controls

MODEL NO		DESCRIPTION			
POWER DISCONNECT SWITCH					
DCS252	2 Pole	25 Amp	120-277 V.A.C. RES.		
DCS303	3 Pole	30 Amp	120-600 V.A.C. RES.		
DCS403	3 Pole	40 Amp	120-600 V.A.C. RES.		
DCS803	3 Pole	80 Amp	120-600 V.A.C. RES.		
DCS1003	3 Pole	100 Amp	120-600 V.A.C. RES.		
LINE VOLTAGE THERMOSTAT					
**T5100	SPST	Line Duty	25 Amp	120-277V	45°-90°F
T5102	DPST	Line Duty	25 Amp	120-277V	45°-90°F
LOW VOLTAGE THERMOSTAT (ALL CA1 MODELS)					
T5100	SPST	Low Volt/Pilot Duty	125V	45°-90°F	(3.3 thru 20 Kw units)
T5122	2-Stage	Low Volt	125VA	45°-90°F	(25 thru 50 Kw units)
STRATIFICATION THERMOSTAT					
TC5102	SPST	Low Volt/Pilot Duty (w/Relay)	70°-130°F		
TC5103	SPST	Line Duty	Amp	120-240V	70°-130°F
SUMMER FAN SWITCH					
FS5101	SPST	Line Volt	120-277V		
FS5102	SPST	Line Volt	480-600V		

* Wall thermostat must be used when built-in stratification thermostat is required.

**Use T5102 when three phase control is required.

Field Installed Wall Mounted Controls

MODEL NO.		DESCRIPTION				
LINE VOLTAGE THERMOSTAT						
**TW141	SPST	22 Amp	120-240V	18 Amp	277V	40°-90°F
TW1512	DPST	30 Amp	120-240V	25 Amp	277V	40°-90°F
LOW VOLTAGE THERMOSTAT (ALL CA1 MODELS)						
A6176	SPST	Low Volt/Pilot Duty	50°-80°F	(3.3 thru 20 Kw units)		
TW123	2-Stage	Low Volt	45°-85°F	(25 thru 50 Kw units)		
STRATIFICATION THERMOSTAT						
TC1602	SPST	Line Volt	120-277V	70°-140°F		
SUMMER FAN SWITCH						
FSW5111	SPST	Line Volt	120-277V			
FSW5112	SPST	Low Volt	(w/Relay)			
LOW VOLTAGE THERMOSTAT & SUMMER FAN SWITCH (w/Relay) (ALL CA1 MODELS)						
TFS5101	SPST	Line Volt	40°-90°F			
TFS5102	2-Stage	Low Volt	45°-85°F			

NOTE: Control Accessories shipping wt. approx. 1 lb. each.

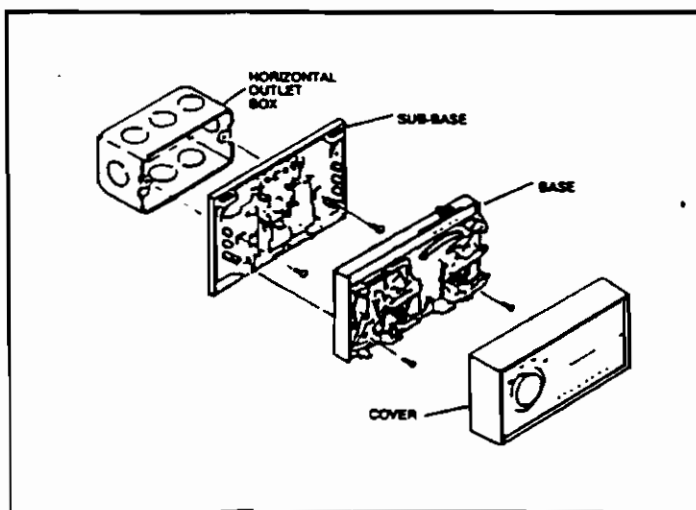
**Use TW1512 when three phase control is required.

SERIES 5100
TASKMASTER
Installation Instructions

**TFS5102 • TASKMASTER SERIES
REMOTE MOUNTING
24 VOLT OPERATION
TWO STAGE CONTROL & INTEGRAL FAN SWITCH**

- 1) Disconnect heater from power supply.
- 2) At the desired location, run the thermostat cable through the hole in the center of the thermostat mounting sub-base. Leave about three inches of wire for connections. For the correct number of wires, see appropriate heater or control package wiring diagram and instructions.
- 3) Attach the sub-base directly to the wall or on a HORIZONTAL outlet box. Level the sub-base with a spirit level.
- 4) Connect the wires to the sub-base following the wiring diagram. Complete installation of wiring on the heater and/or control package. Plug the cable entrance hole to prevent drafts from affecting thermostat operation.
- 5) Remove the thermostat cover by pulling up the bottom edge until it snaps free of the locking springs. Set the heat anticipator to correspond with the primary system control (relay, etc.). The tabs along the top inside edge fit the sockets on the upper corners of the sub-base.
- 6) Hang the thermostat on the sub-base and tighten the two captive screws on the thermostat base. Replace cover by hooking cover tabs into the thermostat base and pushing down until the cover snaps into the locking springs.
- 7) Restore power to the heater and check for correct operation.

FAN SWITCH	SYSTEM SWITCH	FUNCTION
On	Off	Fan on - heat off
On	Auto	Fan on - stat cycles 2 stages heat
Auto	Off	Fan off - heat off
Auto	Auto	Fan cycles with first stage heat - stat cycles 2 stages heat



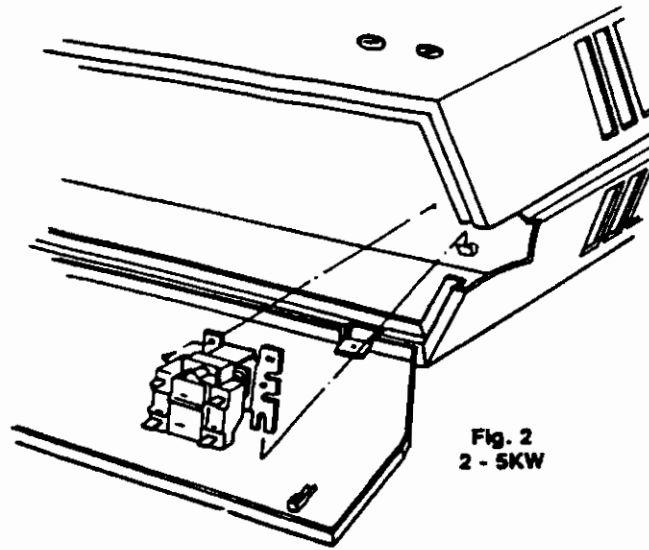


Fig. 2
2 - 5KW

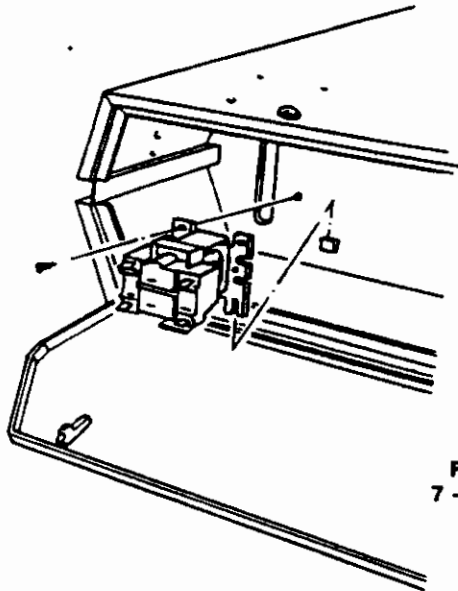


Fig. 2
7 - 20KW

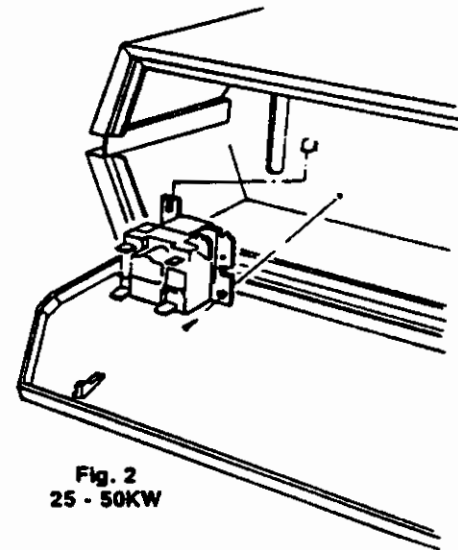


Fig. 2
25 - 50KW

- 8) Fig. 2 Mount low volt relay in wiring compartment. Slip long leg of relay base under raised section of control mounting plate and attach diagonally opposite corner of relay base to control mounting plate with the No. 8 sheet metal screw supplied.

NOTE: Models 5102 thru 5105

Relay is mounted next to heater terminal block

Models 5107 thru 5150

Relay is mounted next to heater terminal board

- 9) Wire relay according to wiring diagram located on inside of heater bottom panel. Attach relay leads 6, 8, 7 & 9 to terminals 6, 8, 7 & 9 on terminal board.
- 10) After installation is complete, depress the reset button to insure continuity before applying power. After power is available to unit, check for proper operation.

SERIES 5100

TASKMASTER

Installation Instructions

**COMBINATION WALL/CEILING SWIVEL BRACKET
FOR HORIZONTAL AIR DELIVERY • TASKMASTER SERIES**

MODEL A5105	USE WITH 5102-5105 UNITS
MODEL A5120	USE WITH 5107-5120 UNITS
MODEL A5150	USE WITH 5125-5150 UNITS

MINIMUM MOUNTING DISTANCES

12" FROM CEILING AND ADJACENT SURFACES
7' FROM FLOOR TO BOTTOM OF HEATER

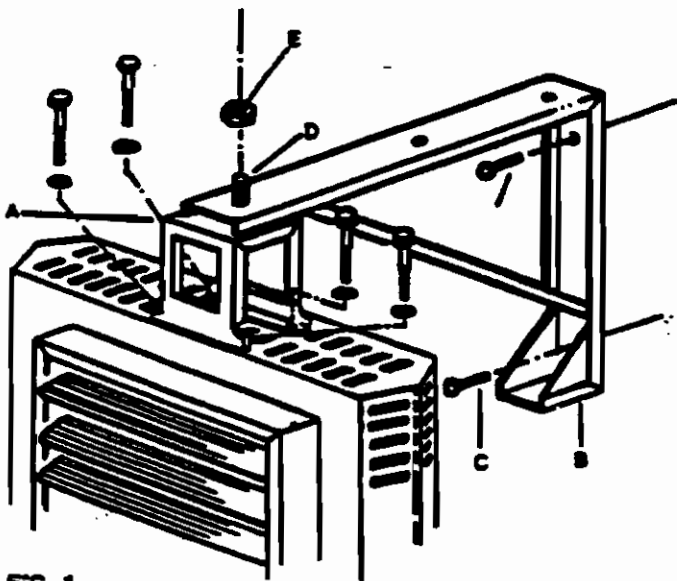


FIG. 1

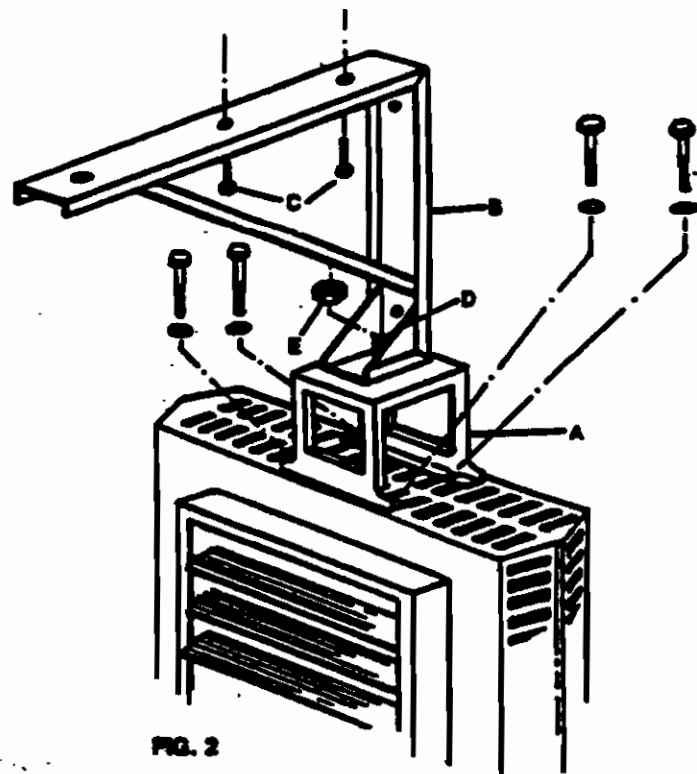


FIG. 2

- 1) Swivel hanger brackets can be used to suspend unit heaters from either the wall (Fig. 1) or the ceiling (Fig. 2).
- 2) Attach hanger base "A" to top of heater with the four $\frac{1}{2}$ x 18 cap screws and lockwashers (provided in envelope).
- 3) Attach main hanger frame "B" to wall or ceiling in desired location using lag screws "C" or other suitable attachments (supplied by others).
- 4) Lift heater into position inserting stud "D" through hole in main hanger frame and attach lock nut (provided in envelope) "E" tightening to within two turns of being tight.

Honeywell

TRADELINE® T874A-F Multistage Thermostats/Q674A-E,G Subbases

Installation Instructions for the Trained Service Technician.

Application

The T874A-F Thermostats provide 24 to 30 Vac control for heating and/or cooling systems as listed in Table 1.

TABLE 1—THERMOSTAT HEATING AND/OR COOLING STAGES

T874	A	B	C	D	E	F
Heating Stages	1	1	2	2	—	2
Cooling Stages	1	2	1	2	2	—

The Q674A-E,G Subbases provide wiring terminals, system and fan switching, and mounting bases for T874 Thermostats as listed in Table 2.

TABLE 2—SUBBASE SWITCHING POSITIONS.

Q674 Model	Switch Positions	Fan
A	Heat-Auto-Cool	Auto-On
B	Heat-Off-Cool	Auto-On
C	Off-Auto	Auto-On
D	None	None
E	Off-Heat-Auto-Cool	Auto-On
G	Off-Auto	None

Operation

On a 2-heat thermostat, the two stages of heat make sequentially as the temperature drops. *Make* refers to the mercury switch initiating a call for heat or cool.

There are about 2° F (1° C) between stages so that the second stage makes only when the first stage cannot handle the load. This is the *interstage differential*.



Recycling Notice

This control contains mercury in a sealed tube. Do not place control in the trash at the end of its useful life.

If this control is replacing a control that contains mercury in a sealed tube, do not place your old control in the trash.

Contact your local waste management authority for instructions regarding recycling and the proper disposal of this control, or of an old control containing mercury in a sealed tube.

If you have questions, call Honeywell Inc. at 1-800-468-1502.

Installation

WHEN INSTALLING THIS PRODUCT...

1. Read these instructions carefully. Failure to follow them could damage the product or cause a hazardous condition.
2. Check the ratings given in the instructions and on the product to make sure the product is suitable for your application.
3. Installer must be a trained, experienced service technician.
4. After installation is complete, check out product operation as provided in these instructions.

CAUTION

1. Disconnect power supply to prevent electrical shock or equipment damage.
2. To prevent interference with the thermostat linkage, keep wire length to a minimum and run wires close as possible to the subbase.
3. Do not overtighten thermostat captive mounting screws because damage to subbase threads can result.
4. Do not short across coil terminals on heating relay or gas control. This can burn out the thermostat heat anticipator.

IMPORTANT: Thermostats are calibrated at the factory by using subbases mounted at true level. Inaccurate subbase leveling will cause thermostat control deviation.

LOCATION

Locate the subbase about 5 ft (1.5m) above the floor in an area with good air circulation at average temperature. Do not mount the subbase where the thermostat may be affected by:

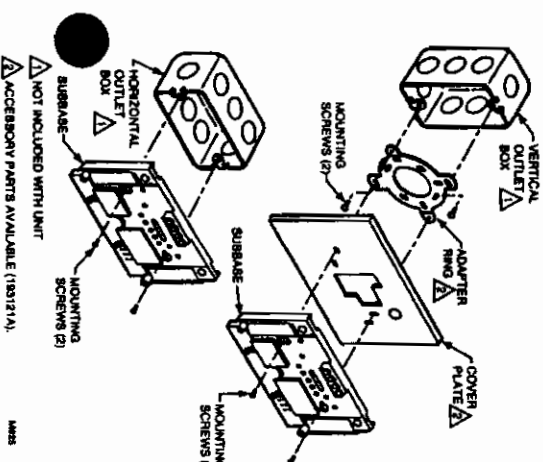
- drafts or dead spots behind doors and in corners.
- hot or cold air from ducts.
- radiant heat from sun, appliances or fireplace.
- concealed pipes and chimneys.
- unheated (uncooled) areas such as an outside wall behind the thermostat.

MOUNTING THE SUBBASE

The thermostat subbase can be mounted on a vertical outlet box, horizontal outlet box or directly on the wall.

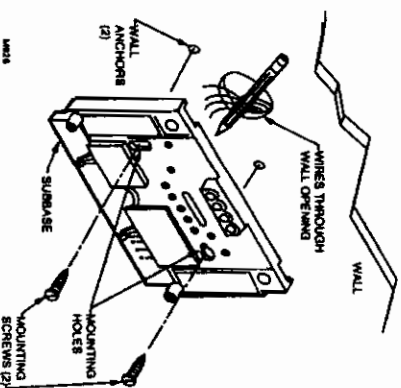
1. If you must mount the subbase on a vertical outlet box, order Honeywell 193121A Adapter Assembly (Fig. 1). The assembly includes an adapter ring, two screws and a cover plate to cover marks on the wall. Install the ring and cover plate on the vertical outlet box.

Fig. 1—Installation of subbase on outlet box.



For a wall installation, hold subbase in position and mark holes for anchors. See Fig. 2. Obtain wall anchors locally. Take care that the wires do not fall back into the wall opening. Set aside subbase. Drill two 3/16 in. (4.8 mm) holes and gently tap anchors into the holes until flush with the wall.

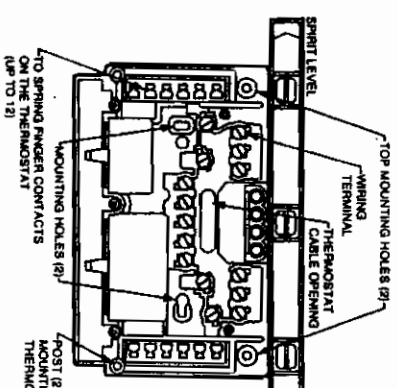
Fig. 2—Installation of subbase on wall.



3. Secure the cover plate (if used) and subbase screws provided. Do not fully tighten the subbase screws.
4. Level the subbase using a spirit level, as shown in Fig. 3, and firmly tighten subbase mounting screws. Subbase mounting holes provide for minor out-of-level adjustments.

IMPORTANT: An incorrectly leveled subbase will cause the temperature control to deviate from setpoint.

Fig. 3—Subbase components and leveling procedure.

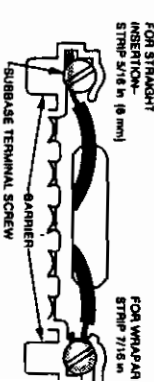


WIRING THE SUBBASE

All wiring must comply with local electrical code ordinances. Follow equipment manufacturer wiring instructions when available. To wire subbase, proceed as follows:

1. Connect the system wires to the subbase as shown in Figs. 8 through 16. A letter code is located on the terminal for identification. The terminal identifier is straight or conventional wraparound wiring code. See Fig. 4.

Fig. 4—Wiring connections.



2. Your Q674 Subbase can require one or more terminal jumpers. Refer to the wiring diagrams for specific terminals to be jumpered. See Fig. 4 for proper application.

CAUTION

Never install more than one wire per terminal unless factory supplied jumper with spade is used. See Fig. 7.

TABLE 4—JUMPER APPLICATIONS.

If your subbase has:	Application	Use Fig.
RC, RH terminals	single transformer system	5
adjacent terminals	special system operation or LED indication	6
nonadjacent terminals		7

3. Firmly tighten each terminal screw.
4. Fit wires as close as possible to the subbase. Push excess wire back into the hole.
5. Plug hole with nonflammable insulation to prevent drafts from affecting the thermostat.

Fig. 5—Jumper RC and RH for single transformer system. Strip wire 3/4 in. [19 mm].

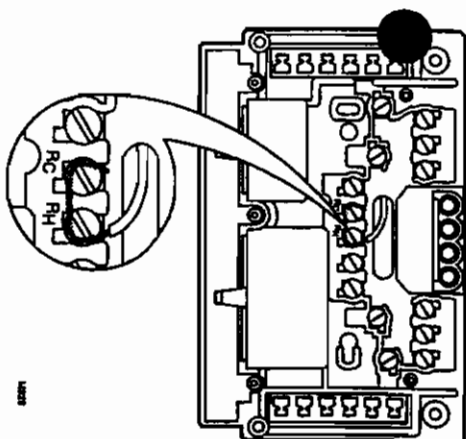
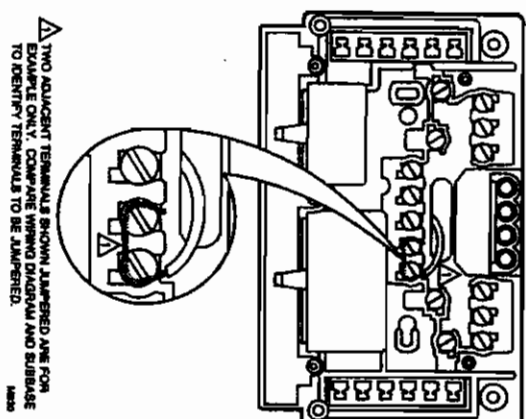
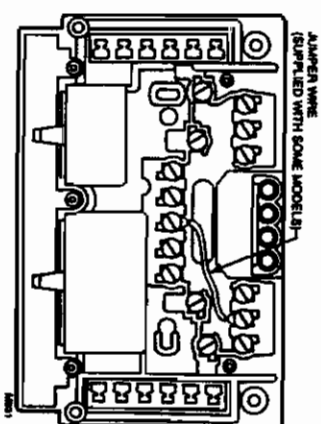


Fig. 6—Jumper adjacent terminals for special system hookup. Strip wire 3/4 in. [19 mm].



△ TWO ADJACENT TERMINALS SHOWN JUMPED ARE FOR EXAMPLE ONLY. COMPARE WIRING DIAGRAM AND SUBBASE TO IDENTIFY TERMINALS TO BE JUMPED.

Fig. 7—For nonadjacent terminals, use jumper supplied with subbase.



NOTE: Only the T874D Thermostat is shown with the subbase. This thermostat/subbase provides 2-stage heating and 2-stage cooling connections. If using another model, see Fig. 16 and Table 4.

TABLE 4—THERMOSTAT BULB CONFIGURATION.

Model No.	Heating Bulbs	Cooling Bulbs
T874A	H1	C1
T874B	H1	C1, C2
T874C	H1, H2	C1
T874D	H1, H2	C1, C2
T874E		C1, C2
T874F	H1, H2	

Fig. 8—T874A-D/O874A in standard heating/cooling system.

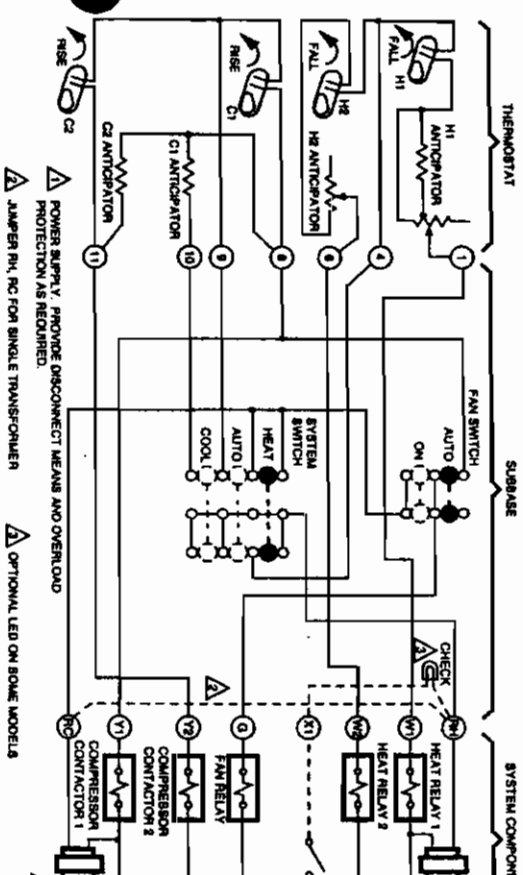


Fig. 9—T874C-D/O874B in standard heating/cooling system with separate transformers for heating/cooling.

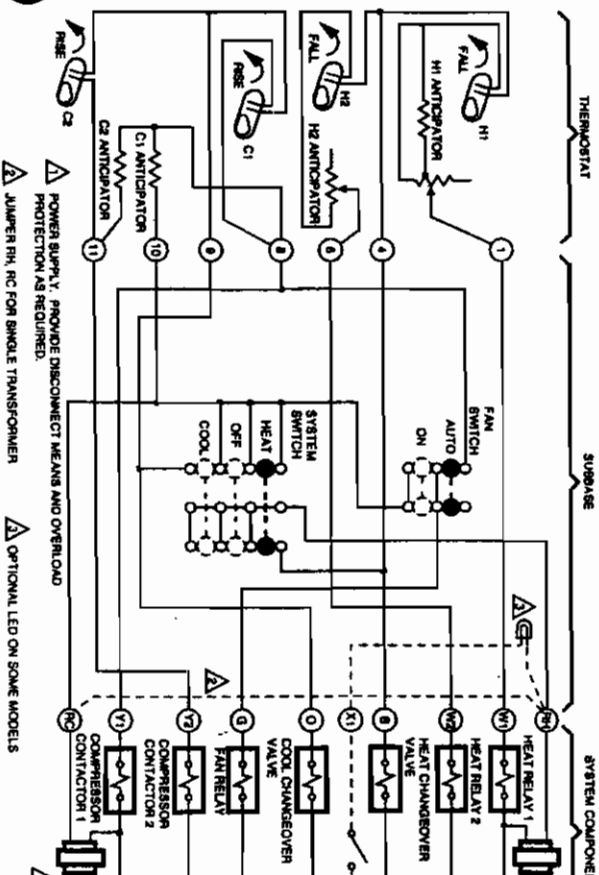


Fig. 10—T874D/O874B in standard heating/cooling system with single transformer for heating and cooling. Exact replacement for York model no. ZTB04700324.

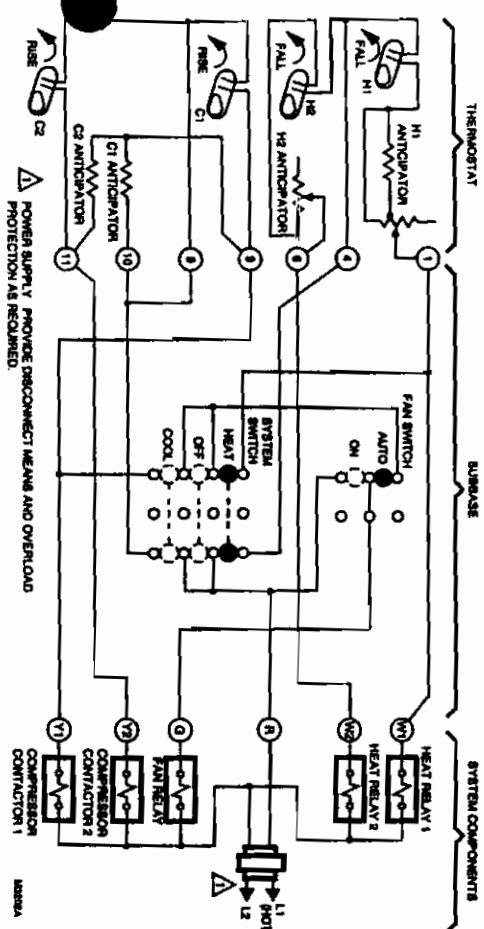


Fig. 11—T874D,E,F/O874C in standard heating/cooling system.

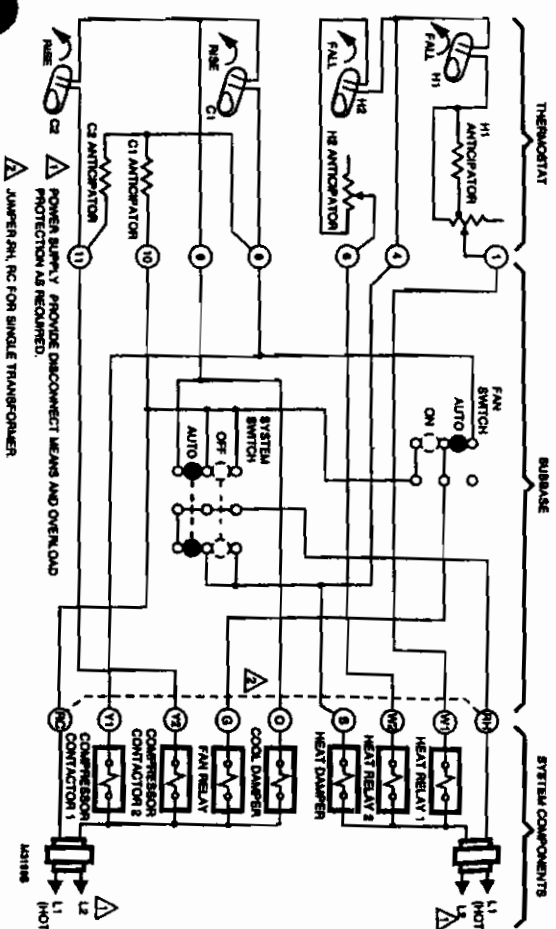


Fig. 12—T874A,D,F/O874D in standard heating/cooling system.

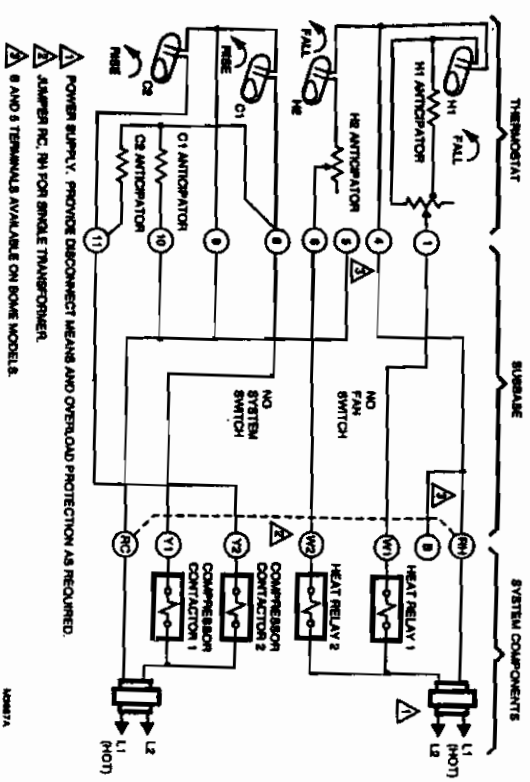


Fig. 13—T874D/O874E in standard heating/cooling system.

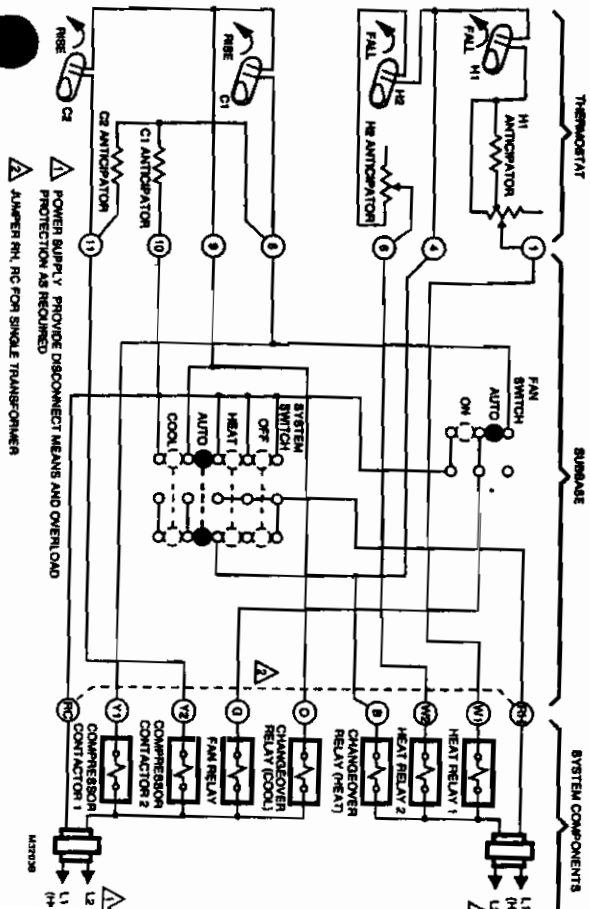


Fig. 14—T874A-F/O674G in standard heating/cooling system.

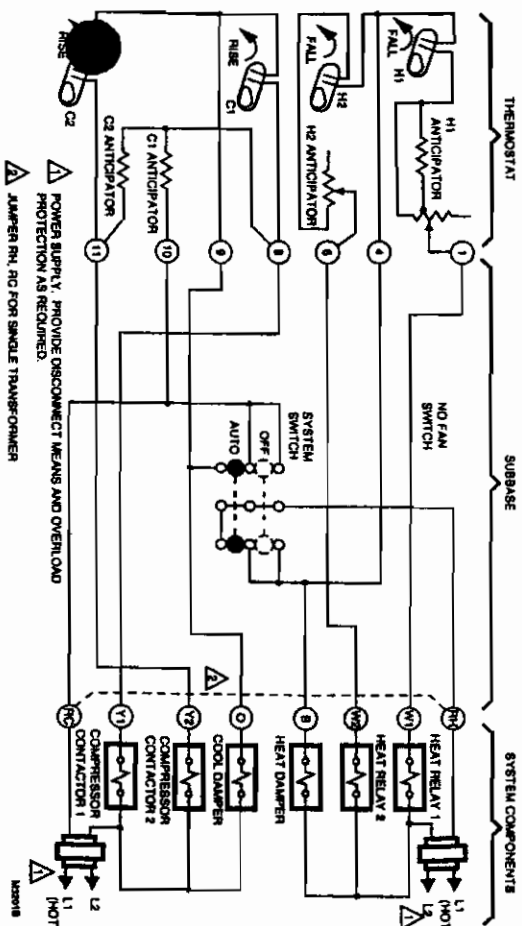


Fig. 15—T874C/O674B in standard application.

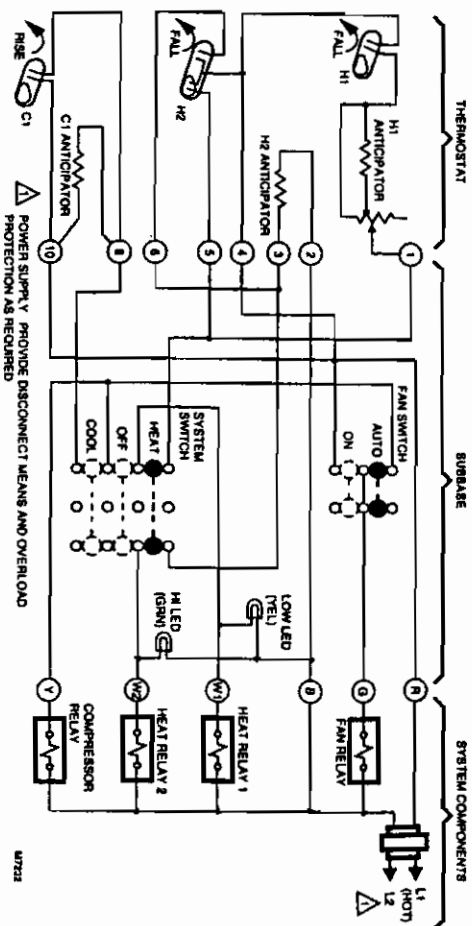
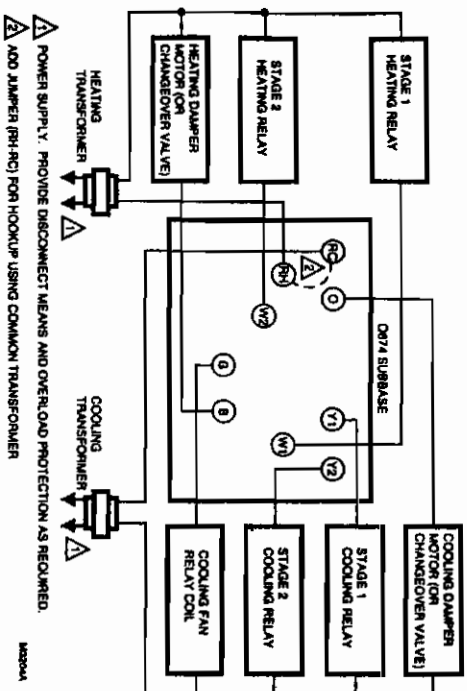


Fig. 16—Typical O674 terminal designations. The thermostat and subbase used determines the n of system components controlled.



TEMPERATURE LEVER STOPS

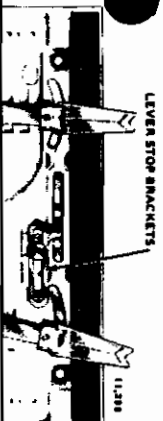
Some thermostats have factory-installed temperature lever locking screws (Fig. 17) and/or stop brackets (Fig. 18). Use these only if the HEAT and COOL temperature set point lever ranges are to be restricted. If the components are factory-installed, see the specific section below for the adjustment procedure.

If a temperature range restriction is required and the locking components are not factory-installed, it is necessary to order a 4074BCK Envelope Assembly. This envelope includes two stop brackets, one brass insert and one bracket mounting screw for restricting the adjustable range of the HEAT and COOL set point levers. Also, the envelope includes two screws with plastic insulated heads for locking the set point control levers in position. If the components are to be used, see the specific section below for the installation procedure.

Fig. 17—Location of lever locking screws.



Fig. 18—Location of lever stop brackets.



INSTALL AND ADJUST LOCKING LEVER SCREWS

The two screws with insulated heads shown only if the HEAT and COOL levers are to be placed at a specific temperature control point. Use standard screws that provide metal-to-metal contact for the lever brackets.

1. Refer to Fig. 20 for screw hole locations.
2. Install the two screws with insulated heads in the indicated holes. Do not overtighten screws.
3. Set the HEAT lever and the COOL lever temperature control points.
4. Firmly tighten both screws.

INSTALL AND ADJUST STOP BRACKETS

Install the stop brackets only if there is a need for the adjustable range of the heating and cooling set point levers.

1. Turn to the back of the T874 Thermostat. Install the stop bracket in the plastic base below window. See Fig. 19.
2. Push the brass insert into the hole with your finger.
3. Turn to the front of the T874 Thermostat.
4. Place the two stop brackets in position within the slot between the HEAT and COOL levers.
5. Insert the mounting screw into the two stop brackets and attach to the brass insert. Tighten the screw to pull the brass insert into the back of the thermostat.
6. Loosen the mounting screw enough so the brackets can slide for adjustment.
7. Move the HEAT and COOL set point levers to the maximum temperature that is desired.
8. Slide the stop brackets until one rests against the HEAT lever and the other against the COOL lever.

Fig. 20.

10. If the HEAT and COOL levers are to be locked in place at a specific temperature, use the two insulated head screws supplied instead of the two adjustable lever stop brackets.

Do not use standard screws that provide metal-to-metal contact with the stop brackets. Short circuiting and potential equipment damage may result.

Fig. 18—Installing brass insert.

This diagram illustrates the installation of a brass insert into a thermostat housing. The components shown are:

- LED WINDOW**: The top opening of the thermostat housing.
- INSERT HOLE**: The hole in the housing where the brass insert is placed.
- BRASS INSERT**: The component being installed into the hole.
- WASHER**: A small circular component placed behind the brass insert.

Diagram illustrating the components of the heat exchanger assembly:

- HEAT LEVER
- COOL LEVER
- LOCKING LEVER STOP
- HOLE WITH BRASS INSERT
- BRACKET TABS
- BRACKET SLOTS
- ADJUSTABLE LEVER STOP
- MOUNTING SCREW
- HOLES FOR INSULATED LOCKING LEVER SCREWS



1. Remove the thermostat cover by pulling the bottom edge of the cover upward until it snaps free of the cover clip.

NOTE: The cover is hinged at the top and must be removed by pulling up at the bottom.

2. Carefully remove and discard the polystyrene packing insert that protects the mercury switches during shipment.

3. Turn over the thermostat base and note the spring fingers that engage the subbase contacts. Make sure the spring fingers are NOT bent flat, preventing proper electrical contact with the subbase.

4. Set the adjustable heat anticipator indicators to the respective current setting for each stage. See Setting the Heat Anticipator section.

5. Note the two tabs on the top inside edge of the thermostat base. The tabs fit into corresponding slots on top of the subbase. Mount the thermostat on the subbase.

6. Align the two captive mounting screws in the thermostat base with the posts on the subbase. See Fig. 21. Tighten both screws. *Do not overtighten screws or damage to subbase posts can result.*

SETTING THE HEAT ANTICIPATOR

Move the indicator to match the current rating of the primary control. See Fig. 22. When using the 1874 Thermo-stat with two stages of heating, set each heat anticipator to match its respective primary control current draw. If you cannot find the current rating on the primary control, or if a further adjustment is necessary, see NOTE and use the following procedure to determine the current draw of each stage:

The current draw must be measured with the thermostat removed from the subbase and the power on to the heating system.

1. Connect an ac ammeter of appropriate range between the heating terminals of the subbase:

Stage 2: between W2 and RH or R.

2. Move the system switch to AUTO or HEAT (if used).
3. After one minute, read the ammeter and record the reading:

Stage 1: _____ amperes
Stage 2: _____ amperes

_____ amperes.

amperes.

NOTE: If equipment cycles too fast, set the indicator to a higher current rating, not more than one-half division at a time, and recheck cycle rate. Most conventional 2-stage heating equipment is designed to operate at three cycles per hour per stage, and 1-stage heating equipment at six cycles per hour, at 50 percent load condition. When using the 1874 Thermostat in heat pump systems, set the heat anticipator at 140 percent of the actual primary control current draw to reduce the cycling rate.

Diagram of the control panel showing the 'STAGE ONE ANTICIPATOR HEATING CONTROL' and 'STAGE TWO ANTICIPATOR HEATING CONTROL' knobs, and the 'MATCH CURRENT RATING OF PRIMARY CONTROL' indicator.

Most heat pump systems should cycle 2-1/2 to 3 times per hour.

4. Hang the upper edge of the thermostat cover on top of the thermostat base and swing the cover downward until it engages with the cover clip.

Move the heating and cooling set point levers (Fig. 23) to the desired comfort positions. One lever controls all stages of heating, and another lever controls all stages of cooling. The minimum differential between heating and cooling set point is 3° F [1.7° C].

The subbase switching positions control operation as described below (Fig. 23).

the following functions):

AUTO: Thermostat automatically changes heating and cooling system operation on the indoor temperature.

/ HEAT: Heating system is automatical
by the thermostat. Cooling system is
COOL: Cooling system is automatical
by the thermostat. Heating system is
FAN SWITCH

ON: Fan operates continuously.
AUTO: Fan operates with cooling coil

To move the subbase switches to the desired positions, use thumb and index finger to slide must stop over desired function indicator position. circuit operation.

HEATING

Move the system switch on the subbase HEAT (if used) and the fan switch to AUTOMATIC heating set point lever on the thermostat about halfway above room temperature. Heating should start after a short delay. Fan starts immediately after a short delay. Fan shuts off immediately after a short delay. Fan shuts off immediately after a short delay. Fan shuts off immediately after a short delay.

NOTE: In heat pump applications, time delays before the compressor is activated to prevent cycling. The delays are provided by a timer that prevents the compressor from starting to five minutes from when the thermostat calls for the compressor, or from when the system power.

Move the system switch on the subbase COOL (if used) and the fan switch to AUTO cooling set point lever on the thermostat about below room temperature. The cooling and fan (see NOTE above). Move the cool lever about above room temperature. The cooling and fan

Move the subbase system switch to OFF switch to ON. The fan should run continuous fan switch to AUTO. In the AUTO position, it controlled by the heating or cooling system of

Calibration

THERMOSTAT

T874 Thermostats are accurately calibrated at the factory. They do not have provision for field calibration.

THERMOMETER

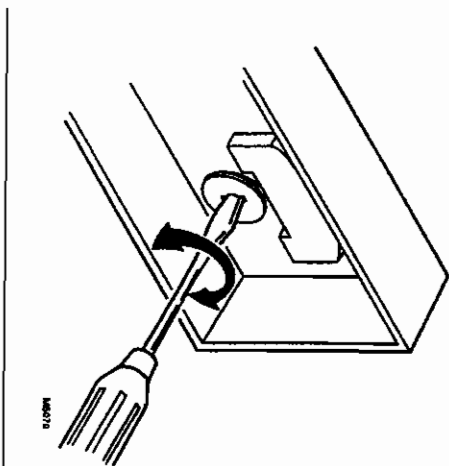
The thermometer in the thermostat has been accurately calibrated at the factory. The thermometer should need adjustment only if it has been dropped or shifted due to mishandling.

If the set point lever and the thermometer reading do not agree, use the following procedure:

1. Remove the thermostat cover by pulling up from the bottom of the cover until it clears the mounting slots.
2. Set the thermostat cover on a table near an accurate thermometer.
3. Allow ten minutes for cover thermometer to sense area temperature; compare the readings. Be careful not to touch the thermometer or breathe on it.
4. If the readings are the same, replace cover and put the system into operation.
5. If the readings are different, insert a small screwdriver thermometer slot (Fig. 24) and turn it until the thermometers have the same reading.
6. Replace thermostat cover and put the system into operation.

NOTE: Hand never will offset the thermometer reading. After making each adjustment, wait ten minutes for the thermometer to stabilize before comparing.

Fig. 24—Thermometer calibration.



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Home and Building Control

Honeywell Inc.

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Golden Valley, Minnesota 55422

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Honeywell Limited—Honeywell Limited

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**SQUARE D**

Instruction Bulletin | Directives d'utilisation | Boletín de instrucciones

Ref. / réf. 312AS
30072-013-19A
Raleigh, NC, USA 9/95**Manual Starters
Démarreurs manuels
Arrancadores manuales**

Class/ Classe/ Clase	Type/ Tipo	Series/ Série/ Serie	Size / Taille / Tamaño
2510	M & T	A	M-0, M-1 & M-1P

INTRODUCTION

This bulletin provides assembly, modification, and parts ordering instructions.

INTRODUCTION

Ce bulletin contient des directives pour assembler, modifier et commander des pièces.

INTRODUCCION

Este boletín suministra instrucciones de montaje, modificación y solicitud de piezas de repuesto.

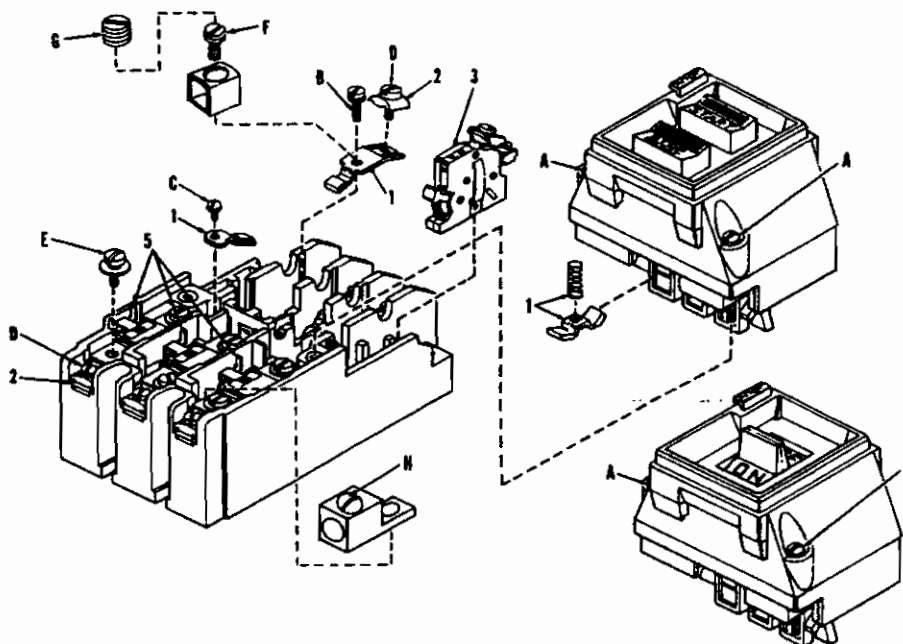


Figure / Figura 1 Manual Starter Assembly / Assemblage du démarreur manuel / Montaje del arrancador manual

**DANGER / PELIGRO****HAZARDOUS VOLTAGE.**

Disconnect all power before working on equipment.
Electrical shock will cause death or severe injury.

TENSION DANGEREUSE.

Débranchez toutes les alimentations avant de manipuler le dispositif.
L'électrocution entraînera la mort ou des blessures graves.

TENSION PELIGROSA.

Desconecte toda la alimentación antes de realizar cualquier trabajo en el equipo.
Las descargas eléctricas podrán producir la muerte o lesiones personales serias.

CONTACT ACTUATOR

Movable contacts are operated by a push button or toggle operator.

ACTIONNEUR DE CONTACT

Les contacts mobiles sont activés par un opérateur de type bouton-poussoir ou bascule.

ACTUADOR DE CONTACTOS

Los contactos móviles funcionan mediante un botón pulsador u operador articulado.

CONTACT INSPECTION

Loosen the two captive screws (A) holding the contact actuator mechanism to the contact block. Lift the contact actuator to expose the contacts.

Discoloration and slight pitting do not harm silver alloy contacts. Do not file contacts; this wastes contact material. Replace contacts only when worn thin. Table 5 lists replacement parts.

CONTACT REPLACEMENTS

To replace the contacts, loosen the two captive screws (A) and remove the contact actuator. Remove the movable contacts (1) from the yoke bar by compressing the contact spring and sliding the contact sideways. Change the contact springs before inserting new movable contacts. Remove the stationary contacts by loosening the contact mounting screws (B and C). Reassemble in reverse order (see Figure 1).

WIRING

Use copper wire only on device power and control terminals.

OVERLOAD RELAYS

Standard: Melting alloy thermal overload relays: incorporate 1 or 3 thermal units. (3-phase manual starters manufactured before mid-1972 had a shorting strap installed in the center leg of the overload relay. To convert these devices from 2 to 3 thermal units, remove the shorting strap and install a third thermal unit.)

Note: thermal units must be installed and the device reset before starter contacts will operate. Install thermal units so the type designation can be read and with the pawl (item 5) above the ratchet wheel as shown in Figure 1.

Continued overcurrent through the thermal unit raises its temperature, melting the alloy in its solder pot, allowing the ratchet wheel to rotate. This releases the

INSPECTION DES CONTACTS

Desserrer les deux vis prisonnières (A) en immobilisant le mécanisme de l'actionneur de contact contre le bloc de contacts. Soulever l'actionneur pour faire apparaître les contacts.

L'altération de la couleur ou de légères piqûres de surface n'altèrent en rien les contacts à alliage d'argent. Ne pas limer les contacts; ceci abîme le matériau de contact. Ne remplacer les contacts que lorsqu'ils sont usés. Le tableau 5 donne la liste des pièces de rechange.

REEMPLACEMENT DES CONTACTS

Pour remplacer les contacts, desserrer les deux vis prisonnières (A) et enlever l'actionneur de contact. Retirer les contacts mobiles (1) de la barre de la bobine de dérivation en serrant le ressort du contact et en faisant glisser ce dernier latéralement. Remplacer les ressorts du contact avant d'insérer les contacts mobiles neufs. Retirer les contacts fixes en desserrant les vis de montage (B et C). Remonter dans l'ordre inverse (voir figure 1).

BORNES

N'utiliser que du fil en cuivre sur les bornes d'alimentation et de contrôle du dispositif.

RELAIS DE SURCHARGE

Standard: *Relais de surcharge à fusion d'alliage*: comprend de une à trois unités thermiques. (Les démarreurs manuels triphasés fabriqués avant la mi 1972 sont dotés d'une bande de court-circuit installée dans la branche centrale du relais de surcharge. Pour convertir les dispositifs à 2 unités thermiques en dispositifs à 3 unités, retirer la bande de court-circuit et installer une troisième unité thermique.)

Remarque: Pour que les contacts du démarreur soient fonctionnels les unités thermiques doivent être installées et le dispositif doit être réinitialisé. Installer les unités thermiques en s'assurant que l'indication du type est lisible et en plaçant le crochet (élément 5) sur la roue à rochet conformément à la figure 1.

INSPECCION DE CONTACTOS

Afloje los dos tornillos cautivos (A) sujetando el mecanismo del actuador de contactos al bloque de contactos. Levante el actuador de contactos de manera que se vean los contactos.

La decoloración y picaduras moderadas no dañan los contactos de aleación de plata. No lime los contactos; puesto que esto hace que se desperdicie el material del contacto. Reemplace los contactos sólo una vez que estén desgastados. La tabla 5 lista las piezas de repuesto.

REEMPLAZO DE CONTACTOS

Para reemplazar los contactos, afloje los dos tornillos cautivos (A) y retire el actuador de contactos (1) del yugo al comprimir el resorte del contacto y deslizar el contacto lateralmente. Cambie los resortes de los contactos antes de insertar los nuevos contactos móviles. Retire los contactos fijos aflojando los tornillos de montaje (B y C) de los contactos. Vuelva a montarlos en el orden inverso al de su instalación (vea la figura 1).

CABLEADO

Utilice sólo conductores de cobre en la alimentación del equipo y las terminales de control.

RELEVADORES DE SOBRECARGA

Estándar: elevadores de sobrecarga térmica de aleación fusible: incorpore 1 ó 3 elementos térmicos. (Los arrancadores manuales de 3 fases fabricados en la primera mitad de 1972 incluían una cinta cortocircuitadora instalada en la pata del centro del relevador de sobrecarga. Para convertir estos dispositivos de 2 a 3 elementos térmicos, retire la cinta cortocircuitadora e instale un tercer elemento térmico.)

Nota: es necesario instalar los elementos térmicos y restablecer el equipo antes de poner en funcionamiento los contactos del arrancador. Instale los elementos térmicos para que se pueda leer la designación de tipo y con el trinquete (artículo 5) sobre la rueda dentada como se muestra en la figura 1.

overload relay pawl assembly, allowing the toggle spring to retract the contacts. This action also centers the push button or toggle operator, indicating the starter is tripped.

Note: Before resetting the relay, allow one to two minutes for the alloy to solidify. Do not disassemble the overload relay block because motor protection could be disabled, possibly damaging equipment.

Une surintensité continue dans l'unité thermique élève la température et provoque la fusion de l'alliage dans le pot à souder, entraînant la rotation de la roue à rochet. Ceci libère l'assemblage du crochet du relais de surcharge, permettant au ressort de la bascule de retirer les contacts. Cette action centre également l'opérateur à bouton-poussoir ou à bascule, indiquant que le démarreur est déclenché.

Remarque : Avant de réinitialiser le relais, attendre une ou deux minutes que l'alliage se solidifie. Ne pas démonter le bloc de relais de surcharge car, si la protection du moteur est désactivée, l'équipement pourrait être endommagé.

La presencia de sobrecorriente continua en los elementos térmicos eleva su temperatura funde la aleación en su olla para soldadura, lo cual permite la rotación de la rueda dentada. Esto libera el ensamble del trinquete del relevador de sobrecarga, dejando que el resorte articulado retire los contactos. Esta acción también centra el botón pulsador u operador articulado, lo que indica que se ha disparado el arrancador.

Nota: Antes de restablecer el relevador, deje pasar de uno a dos minutos para que se solidifique la aleación. No desmonte el bloque del relevador de sobrecarga ya que puede inhabilitar la protección del motor y posiblemente dañar el equipo.

ELECTRICAL INTERLOCKS (Form X)

One internal interlock, either N.O. or N.C. (3), can be added to all manual starters. It occupies either the upper right-hand or left-hand corner of the device, and is field installable. Table 1 lists location and replacement part numbers for Class 2510 starter interlocks. Table 5 lists replacement parts.

VERROUILLAGES ÉLECTRIQUES (forme X)

Un verrouillage interne, N.O. ou N.F. (3), peut être ajouté à tous les démarreurs manuels. Il est situé sur le coin supérieur droit ou gauche du dispositif et s'installe sur place. Le tableau 1 dresse la liste des emplacements et des numéros des pièces de rechange des verrouillages de démarreurs de classe 2510. Le tableau 5 contient les pièces de rechange.

ENTRELACES ELECTRICOS (Forma X)

Es posible agregar un entrelace interno N.A. o N.C. (3), a todos los arrancadores manuales. Este se coloca en la esquina superior derecha o izquierda del equipo y puede ser instalado por el cliente. La tabla 1 lista la ubicación y los números de las piezas de re puesto para los entrelaces de los arrancadores clase 2510. La tabla 5 lista las piezas de repuesto.

Table / Tableau / Tabla 1 Electrical Interlocks for Class 2510 Starters /
Verrouillages électriques pour démarreurs de classe 2510 / Entrelaces eléctricos para arrancadores clase 2510

Form ⁽¹⁾ / Forme / Forma	Interlock Location / Emplacement du verrouillage / Ubicación del entrelace		Class 9999 Replacement Interlocks / Verrouillages de rechange classe 9999 / Entrelaces de repuesto clase 9999	
	L.H. / Gauche / Izquierdo	R.H. / Droite / Derecho	Type SX11 / Tipo SX11	Type SX12 / Tipo SX12
X1	N.O. / N.A.	...	1	...
X2	...	N.C. / N.F.	...	1

⁽¹⁾ Consult sales office for Form designations for Class 2511 reversing and 2512 two-speed starters.
Consulter le centre de ventes pour les désignations des formes des démarreurs à inversion de classe 2511 et ceux à deux vitesses de classe 2512.
Comuníquese con la oficina de ventas para obtener las designaciones de forma para los arrancadores reversibles clase 2511 y de dos velocidades clase 2512.

LOCK OFF MECHANISM

The starter can be locked only in the OFF position by lifting the metal tab labeled "LOCK" on the contact actuator and placing a padlock through the hole in this tab. In the ON position, withdrawing the LOCK tab opens the contacts of the device.

MÉCANISME DE VERROUILLAGE

Le démarreur ne peut être verrouillé qu'en position d'arrêt (OFF) en soulevant la languette métallique étiquetée «LOCK» sur l'actionneur de contact et en faisant passer un cadenas par le trou de cette languette. Dans la position ON, le retrait de la languette LOCK ouvre les contacts du dispositif.

MECANISMO DE BLOQUEO

El arrancador puede ser bloqueado solamente en la posición OFF (apagado) levantando la orejeta de metal marcada "LOCK" (bloqueo) en el actuador de contactos y colocando un candado a través del agujero en esta orejeta. En la posición ON (cerrado), se abren los contactos del dispositivo al retirar la orejeta de bloqueo.

PILOT LIGHT KIT (Form P11)

A red pilot light usable on any voltage (110-600 V) may be factory installed. Kits may be field installed in the cover of Type 1 surface and flush mounting enclosures. Table 2 lists kits for field modification.

KIT DE LAMPE TÉMOIN (forme P11)

Une lampe témoin rouge à utiliser sur toutes les tensions (110 à 600 V) peut être installée en usine. Les kits peuvent être installés sur place dans le couvercle des armoires type 1 montées en surface ou encastrées. Le tableau 2 dresse la liste des kits à installer sur place.

ACCESORIO DE LA LAMPARA PILOTO (forma P11)

Una lámpara piloto roja utilizable bajo cualquier tensión (110-600 Volts) puede ser instalada en la fábrica. Los accesorios pueden ser instalados por el cliente en la cubierta de los gabinetes de montaje en superficie o empotrados tipo 1. La tabla 2 lista los accesorios para la modificación por el cliente.

Table / Tableau / Tabla 2 Pilot Light Kits / Kits de lampes témoins / Accesorios de la lámpara piloto

Class 9999 Kit / Kit de classe 9999 / Accesorios clase 9999	Voltage Range / Gammas de tension / Gama de tensión
Type MP1 / Tipo MP1	110-120 V / 110 à 120 V
Type MP2 / Tipo MP2	208-240 V / 208 à 240 V
Type MP3 / Tipo MP3	440-600 V / 440 à 600 V

REPLACEMENT INTERIORS

Replacement interiors for Class 2510 NEMA 1 surface and flush mounted enclosures are available with either push button or toggle operation. The catalog lists open type replacement starters.

INTERIEURS DE RECHANGE

Les intérieurs de rechange pour les armoires NEMA 1 montées en surface et encastrées de classe 2510 sont disponibles avec un opérateur à bouton-poussoir ou à bascule. Le catalogue contient la liste des démarreurs de rechange de type ouvert.

INTERIORES DE REPUESTO

Se encuentran disponibles para gabinetes montados en superficie y empotrados NEMA 1 clase 2510 con botón pulsador u operador articulado. El catálogo lista los arrancadores de repuesto de tipo abierto.

Table / Tableau / Tabla 3 Replacement Device Styles / Styles des dispositifs de rechange / Estilos de equipo de repuesto

Operator Type / Type d'opérateur / Tipo de operador			Type 1 / Tipo 1	Type 4 / Tipo 4 S. Steel / Acier inox. / Acero inox.	Type 4X / Tipo 4X Polyester / Poliéster	Type 7 & 9 / Type 7 et 9 / Tipo 7 & 9 Cast Iron / Fonte / Hierro fundido	Type 4X, 7 & 9 / Type 4X, 7 et 9 / Tipo 4X, 7 & 9 Cast Aluminum / Fonte d'aluminium / Aluminio fundido	Type 12 / Tipo 12
Push Button	Bouton-poussoir	Botón pulsador	X	X	X	X	—	X
Toggle	Bascule	Operador articulado	X	—	—	—	X	—

CLASS 2511/2512 MANUAL STARTERS

Class 2511 (reversing) and 2512 (2-speed) manual starters are mechanically interlocked through an interference-type mechanism, part number 31085-070-01. It mounts between the starters and engages the movable contact carriers. Since Classes 2511 and 2512 use a special contact actuator, the standard Class 2510 starter cannot be used for replacement. If either (right-hand or left-hand) unit needs replacement, order a complete starter (see Table 4).

**DÉMARREURS MANUELS
CLASSE 2511/2512**

Les démarreurs manuels de classe 2511 (à inversion) et ceux de classe 2512 (à deux vitesses) sont mécaniquement verrouillés par un mécanisme de type interférence, n° de pièce 31085-070-01. Il se monte entre les démarreurs et engage le porte-contact mobile. Comme les démarreurs de classes 2511 et 2512 utilisent un actionneur de contact spécial, le démarreur de classe 2510 ne peut pas être utilisé en tant que démarreur de rechange. Pour remplacer une unité (de droite ou de gauche), commander un démarreur complet (voir le tableau 4).

**ARRANCADORES MANUALES
CLASE 2511/2512**

Los arrancadores manuales clase 2511 (reversibles) y 2512 (de dos velocidades) están entrelazados mecánicamente a través de un mecanismo de interferencia, número de pieza 31085-070-01, el cual se monta entre los arrancadores y engancha los portacontactos móviles. Puesto que las clases 2511 y 2512 utilizan un actuador de contactos especial, el arrancador clase 2510 no se puede utilizar como repuesto. Si cualquiera de las unidades (derecha o izquierda) tiene que ser reemplazada, solicite un arrancador completo (vea la tabla 4).

**Table / Tableau / Tabla 4 Complete Right-Hand and Left-Hand Replacement Starters /
Démarreurs de rechange droite et gauche complets / Arrancadores de repuesto completos derechos e izquierdos**

Operator Type / Type d'opérateur / Tipo de operador			NEMA Size / Taille / Tamaño	For Class 2511 Reversing Manual Starter / Pour démarreur manuel à inversion classe 2511 / Para arrancadores manuales reversibles classe 2511	For Class 2512 Two-Speed Manual Starter / Pour démarreur manuel à deux vitesses classe 2512 / Para arrancadores manuales de dos velocidades classe 2512
Push Button	Bouton- poussoir	Botón pulsador	M-0	Class / Classe / Clase 2510 Type / Tipo MBO2 Form / Forme/ Forma M3	Class / Classe / Clase 2510 Type / Tipo MBO2 Form / Forme/ Forma M4
Push Button	Bouton- poussoir	Botón pulsador	M-1	Class / Classe / Clase 2510 Type / Tipo MCO3 Form / Forme/ Forma M3	Class / Classe / Clase 2510 Type / Tipo MCO3 Form / Forme/ Forma M4
Toggle	Bascule	Operador articulado	M-0	Class / Classe / Clase 2510 Type / Tipo TBO2 Form / Forme/ Forma M3	Class / Classe / Clase 2510 Type / Tipo TBO2 Form / Forme/ Forma M4
Toggle	Bascule	Operador articulado	M-1	Class / Classe / Clase 2510 Type / Tipo TCO3 Form / Forme/ Forma M3	Class / Classe / Clase 2510 Type / Tipo TCO3 Form / Forme/ Forma M4

**SHORT-CIRCUIT
PROTECTION**

Branch-circuit overcurrent protection must be provided for each contactor or starter. For contactors, provide branch circuit overcurrent protection in accordance with the National Electrical Code. For starters, refer to instructions furnished with the thermal unit selection table.

**PROTECTION CONTRE LES
COURTS-CIRCUITS**

Une protection contre la surintensité des circuits de dérivation doit être fournie pour chaque contacteur ou démarreur. Pour les contacteurs, fournir une protection contre la surintensité des circuits de dérivation conformément au code d'électricité national en vigueur. Pour les démarreurs, se reporter aux directives fournies avec le tableau de sélection de l'unité thermique.

**PROTECCION CONTRA
CORTOCIRCUITO**

Se debe suministrar protección contra sobrecorriente de circuito en derivación a cada uno de los contactores o arrancadores. La protección contra sobrecorriente de circuito en derivación para los contactores se debe suministrar de acuerdo con los reglamentos de instalaciones eléctricas locales. Para obtener información sobre la protección de los arrancadores, consulte las instrucciones provistas con la tabla de selección del elemento térmico.

ASSEMBLY

Table 6 and the device instruction sheet provide factory recommended tightening torques for mechanical, electrical and pressure wire connections. Follow these torques to insure proper functioning of the device. If the contactor actuator is removed for contact inspection or replacement, reset the device after reassembly.

PARTS ORDERING

Specify quantity, part number and description of part, giving complete nameplate data of the device; e.g., 1 contact kit Class 9998 Type ML2 for Class 2510 Type MCG3, Series A manual starter.

ASSEMBLAGE

Le tableau 6 et la fiche de directives du dispositif donnent les couples de serrage recommandés pour les raccordements mécaniques, électriques et de serrage de fils. Respecter ces couples pour assurer un fonctionnement correct du dispositif. Si l'actionneur du contacteur est enlevé pour inspection ou remplacement des contacts, réinitialiser le dispositif après le remontage.

COMMANDES DE PIÈCES

Spécifier la quantité, le numéro de pièce et la description de la pièce en donnant toutes les données de la plaque d'identification du dispositif (par ex., 1 kit de contact de classe 9998 type ML2 pour démarreur manuel série A, de classe 2510 type MCG3).

MONTAJE

La tabla 6 y la hoja de instrucciones del equipo proporcionan los pares de apriete recomendados de fábrica para las conexiones mecánicas, eléctricas y del conductor de presión. Utilice estos pares de apriete para asegurar el funcionamiento adecuado del equipo. Si se quita el actuador de contactos para realizar una inspección o reemplazo del mismo, restablezca el equipo después de volverlo a montar.

SOLICITUD DE PIEZAS

Especifique la cantidad, número y descripción de la pieza, proporcionando los datos completos de la placa de identificación del equipo; por ejemplo, 1 accesorio de contacto clase 9998 tipo ML2 para arrancador manual serie A clase 2510 tipo MCG3.

Table / Tableau / Tabla 5 Parts List⁽¹⁾ / Liste des pièces / Lista de piezas

Item / Art.	Description / Descripción	Part No / N° de pièce / N° de pieza	Quantity / Quantité / Contenido				
			Size / Taille / Tamaño		Size / Taille / Tamaño		Size / Taille / Tamaño
			M-0	M-1	M-1	M-1P	M-1P
			2-P	3-P	2-P	3-P	2-P
1	Contact Kit / Kit de contacts / Accesorio de contacto	Class / Classe / Clase 9998 Type / Tipo ML1	1	1	...	...	...
		Class / Classe / Clase 9998 Type / Tipo ML2	...	...	1	1	1
2	Wire Clamp Screw Assy. / Assem. de vis de fixation de fil / Ensamble del tornillo de la pinza del conductor	30018-070-50	4	6	4	6	...
3 ⁽²⁾	Internal Interlock (N.O.) / Verrouillage interne (N.O.) / Entrelace interno (N.A.)	Class / Classe / Clase 9999 Type / Tipo SX11 ⁽²⁾	...	...	...	...	...
	Internal Interlock (N.C.) / Verrouillage interne (N.F.) / Entrelace interno (N.C.)	Class / Classe / Clase 9999 Type / Tipo SX12 ⁽²⁾	...	...	...	...	...
E	Overload Thermal Unit Fastening Screw Vis de fixation d'unité Thermique de surcharge	21920-16160	4	6	4	6	4

⁽¹⁾For reversing and two-speed starters, refer to "CLASS 2511/2512 MANUAL STARTERS" on page 5.

Pour démarreurs à inversion et à deux vitesses, se reporter à "JÉMARREURS MANUELS CLASSE 2511/2512" on page 5.

Para los arrancadores reversibles y de dos velocidades, vea la sección "ARRANCADORES MANUALES CLASE 2511/2512" on page 5.

⁽²⁾A maximum of either 1 N.O. or 1 N.C. interlock may be added per starter.

Un seul verrouillage N.O. ou 1 N.F. peut être utilisé par un démarreur.

Se puede agregar un máximo de 1 entrelace N.A. o 1 N.C. por arrancador.

Table / Tableau / Tabla 6 Factory Recommended Tightening Torques / Couples de serrage recommandés / Pares de apriete recomendados de fábrica

Item/ Art.	Description / Descripción			Tightening Torque / Couple de serrage / Par de apriete	
				lb-in / lb-po / lb-pulg	N•m
A	Contact Actuator Mechanism Screws (2 per device)	Vis de l'actionneur de contact (2 par dispositif)	Tornillos para el mecanismo del actuador de contactos (2 por equipo)	18 - 21 18 à 21	2.0 - 2.4 2.0 à 2.4
B	Line Side Stationary Contact Fasteners (1 per pole)	Fixations de contact fixe côté ligne (1 par pôle)	Sujetadores de contactos estáticos del lado de línea (1 por polo)	13 - 16 13 à 16	1.5 - 1.8 1.5 à 1.8
C	Load Side Stationary Contact Fasteners (1 per pole)	Fixations de contact fixe côté charge (1 par pôle)	Sujetadores de contactos estáticos del lado de carga (1 por polo)	6 - 9 6 à 9	.7 - 1.0 .7 à 1.0
D	Pressure Wire Connector Screw (2 per pole)	Vis du connecteur de serrage de fil (2 par pôle)	Tornillo conector del conductor de presión (2 por polo)	[1]	[1]
E	Overload Thermal Unit Fastening Screws (2 per element)	Vis de fixation de l'unité thermique de surcharge (2 par élément)	Tornillos sujetadores del elemento térmico de sobrecarga (2 por elemento)	18 - 21 18 à 21	2.0 - 2.4 2.0 à 2.4
F	Lug Fastening Screw (1 per pole)	Vis de fixation de cosse (1 par pôle)	Tornillo de sujeción de la zapata (1 por polo)	18 - 21 18 à 21	2.0 - 2.4 2.0 à 2.4
G	Wire Pressure Screw (1 per pole, line side)	Vis de serrage de fil (1 par pôle, côté ligne)	Tornillo de presión del conductor (1 por polo, lado de línea)	[1]	[1]
H	Wire Pressure Screw (1 per pole, load side)	Vis de serrage de fil (1 par pôle, côté charge)	Tornillo de presión del conductor (1 por polo, lado de carga)	[1]	[1]

[1] Torque as recommended on the device instruction sheet.
Couple recommandé sur la fiche de directives du dispositif.
Par de apriete recomendado en la hoja de instrucciones del equipo.

Electrical equipment should be serviced only by qualified electrical maintenance personnel, and this document should not be viewed as sufficient instruction for those who are not otherwise qualified to operate, service or maintain the equipment discussed. Although reasonable care has been taken to provide accurate and authoritative information in this document, no responsibility is assumed by Square D for any consequences arising out of the use of this material.

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NIAGARA FALLS, NY 14304

INVOICE NUMBER	INVOICE DATE	PAGE NO.
036891	01/20/00	1

NO.	DATE ORDERED	ORDERED BY/REL	DATE SHIPPED	SHIPPED VIA	FREIGHT TERMS	CO. UNIT/INVOICE	ENTERED BY	ACCOUNT NO.	ORDER NO.	SALES PERSON
18C	01/20/00		01/20/00	WILL CALL	PREPAID	01/01	AR	CI0171040	460815	KK

NET 30 DAYS

SKU	CATALOG NUMBER AND DESCRIPTION	QUANTITY ORDERED	QUANTITY BACK ORDERED	QUANTITY SHIPPED	UNIT PRICE	U/M	EXTENDED AMOUNT
8500711651	PS WP833 FS BOX 10 W/3-3/4" T	1	0	1			
8590182133	SQD 9001KS43BH13 SEL SW W/ABL	1	0	1			
8590186472	SQD 8536SG3V025 STARTER S7	1	0	1			
8590187442	SQD 9001KY1 ENCLOSURE 1 HOLE	1	0	1			
8138166410	AP RW125-100 RED WASH 1-1/4X	8	0	8			

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CONDITIONS OF SALE
Orders and requests for returned goods must be made within 30 days and must be accompanied by the invoice.
Returned goods will be examined prior to acceptance.
Minimum charge of 10% will be applied on all returned goods.
Frequency charge of 1/4% per month for and annual total of 18% will be applied to all past due accounts plus legal fees incurred, and if matter be turned over to an attorney for collection an attorney fee of 25% of unpaid invoice will be added to amount owing.
Goods sold are subject to the fair labor standards act of 1938, as amended.
Kron Electric Supply, Inc. certifies that to the best of its knowledge and belief, the amounts invoiced under

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Full Voltage Starters - NEMA Rated

Class 8536



Type SC03
Size 1, 3-Pole Starter

General Information

Type S magnetic starters are used for full-voltage starting and stopping of AC squirrel cage motors. Motor overload protection is provided via melting alloy type thermal overload relays. Type S starters are available in NEMA sizes 00 through 7, and are designed for operation at 600 Vac, 50 to 60 Hz.

Solid State Overload Relay Protection (MOTOR LOGIC™)

These ambient insensitive overload relays are available on sizes 00 through 6 and standard on size 7. They provide phase loss, phase unbalance protection and a power LED indication. To order, add Form H10 (for Class 10), H20 (for Class 20), or H30 (for selectable trip class protection). For more information about Motor Logic™, see page 13-97 and page 13-111.

3-Pole Polyphase - 600 Vac Maximum - 50-60 Hz

Note that prices shown do not include thermal units. Devices require 3 thermal units (Sizes 00-6). Standard trip thermal units are \$9.50 each. See page 13-129 for selection information.

13 NEMA DEFINITE PURPOSE TYPE CONTACTORS AND STARTERS

NEMA Size	Continuous Current Ratings	Motor Volts	Max. Hp	Open Type		NEMA Type 1 General Purpose Enclosure		NEMA Type 4 & 4X Watertight, Dusttight Brushed Stainless Steel Enclosure (Size 0-5)		NEMA Type 4X Watertight, Dusttight, Corrosion-Resistant Glass-Polymer Enclosure	
				Type	Price	Type	Price	Type	Price	Type	Price
00	9	Separate Control 200 1 1/2 230 1 1/2 480 2 575 2		SAQ12*	\$ 171.	SAG12*	\$ 186.	Use Size 0		Use Size 0	
0	15	Separate Control 200 3 230 3 480 5 575 5		SBO2*	215.	SBG2*	230.	SBW12*	\$ 482.	SBW22*	\$ 482.
1	27	Separate Control 200 7 1/2 230 7 1/2 480 10 575 10		SCO3*	247.	SCG3*	262.	SCW13*	480.	SCW23*	490.
2	45	Separate Control 200 10 230 15 480 25 575 25		SDO1*	448.	SDG1*	515.	SDW11*	971.	SDW21*	971.
3	90	Separate Control 200 25 230 30 480 50 575 50		SEO1*	728.	SEG1*	857.	SEW11*	1502.	SEW21*	1676.
4	135	Separate Control 200 40 230 50 480 100 575 100		SFO1*	1685.	SPG1*	1833.	SPW11*	3094.	SPW21*	3793.
5	270	Separate Control 200 75 230 100 480 200 575 200		SGO1*	4087.	SGG1*	4557.	SGW11*	5846.	---	---
6	540	Separate Control 200 150 230 200 480 400 575 400		SHO2*	9683.	SHG2*	12836.	SHW2*	16001.	---	---
7	810	Separate Control 200 --- 230 300 480 600 575 600		SJO2*	13891.	SJG2*	17058.	SJW2*	20223.	---	---

- * Size 6 and 7 are rated NEMA Type 4 only.
 † 120 Volt Polyphase starters are wired for separate control.
 * Coil voltage code must be specified to order this product. Refer to standard coil voltage codes shown at right.

Factory Modifications (Forms) Page 13-109
 Dimensions Page 13-21
 Separate Enclosures (Class 9991) Page 13-102
 Replacement Parts (Class 9998) Page 13-118
 Type S Accessories (Class 9999) Page 13-121

MOTOR LOGIC is a trademark of Square D Company or related companies.

Coil Voltage Codes

Voltage		Code	Price Adder
60 Hz	50 Hz		
24Δ	---	V01	N.C.
120†	110	V02	N.C.
208	---	V08	N.C.
240	220	V08	N.C.
480	440	V06	N.C.
600	550	V07	N.C.
Specify	Specify	V99	\$15.50

Δ 24 V coils are not available on Sizes 4-7. On sizes 00-3, where 24 V coils are available, Form S (separate control) must be specified.
 † 120 Volt Polyphase starters are wired for separate control.
 Note: Voltage codes for use with control transformers. See Page 13-110

For additional information, reference Catalog # 8502CT9701 or D-FAX™ # 1504.



CP1

 Discount
Schedule

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13-15

Square D
www.squared.com
FOR CURRENT INFORMATION

Full Voltage Contactors and Starters - NEMA Rated

Approximate Dimensions
Class 8502, 8536

Dimensions for Class 8502 and 8536 Open Type

NEMA Size	Type	No. of Poles	Fig. No.	Dimensions - inches (Refer to Appropriate Figure)										Wt. lbs.
				A	B	C	D	E	F	G	H	I	J	
00	SAC	2-3	1	3 7/8	4 1/2	4 7/8	10 1/2	14 1/2	7 1/2	3 1/4	...	...	...	4
0	SBO	1-3	1	3 7/8	4 1/2	4 7/8	10 1/2	14 1/2	7 1/2	3 1/4	...	...	...	4
1	SCO	4-5	1	4 1/4	4 1/2	4 7/8	10 1/2	14 1/2	7 1/2	3 1/4	...	...	...	4 1/2
2	SOC	2-3	1	4 1/2	5 1/4	5 1/4	10 1/2	14 1/2	7 1/2	3 1/4	17 1/2	1 1/2	1 1/2	6 1/4
3	SEO	2-3	1	5 1/4	5 1/4	5 1/4	10 1/2	14 1/2	7 1/2	3 1/4	17 1/2	1 1/2	1 1/2	6 1/4
4	SFO	2-3	1	6	5 1/4	5 1/4	10 1/2	14 1/2	7 1/2	3 1/4	17 1/2	1 1/2	1 1/2	18
5	SGO	2-3	1	6 1/4	5 1/4	5 1/4	10 1/2	14 1/2	7 1/2	3 1/4	17 1/2	1 1/2	1 1/2	22
6	SHO	2-3	1	12 1/2	28 1/2	9	3 7/8	5 1/2	5 1/2	18 1/2	4 1/2	7 1/4	80	...
7	SJO	2-3	1	12 1/2	37 1/4	10 1/2	3 7/8	5 1/2	5 1/2	22 1/2	4 1/2	7 1/4	135	...
00, 0, 1, 1P	SAC-SCO	2-3	2	3 1/2	6 1/4	4 7/8	1 1/2	1	1 1/2	12 1/2	6 1/4	3 1/4	5	...
0, 1	SBO-SCO	4	2	4 1/2	6 1/4	4 7/8	1 1/2	1	2 1/2	12 1/2	6 1/4	3 1/4	5 1/2	...
2	SOC	2-3	2	4 1/2	5 1/4	5 1/4	1 1/2	1	2 1/2	12 1/2	6 1/4	3 1/4	7 1/4	7 1/4
3	SEO	2-3	2	5 1/4	5 1/4	5 1/4	1 1/2	1	2 1/2	12 1/2	6 1/4	3 1/4	7 1/4	7 1/4
4	SFO	3	2	6	5 1/4	5 1/4	1 1/2	1	2 1/2	12 1/2	6 1/4	3 1/4	7 1/4	7 1/4
5	SGO	3	2	6 1/4	5 1/4	5 1/4	1 1/2	1	2 1/2	12 1/2	6 1/4	3 1/4	7 1/4	7 1/4
6	SHO	3	2	12 1/2	28 1/2	9	4 1/2	7 1/4	5 1/2	18 1/2	4 1/2	8 1/4	85	...
7	SJO	3	2	12 1/2	37 1/4	10 1/2	4 1/2	7 1/4	5 1/2	22 1/2	4 1/2	8 1/4	140	...

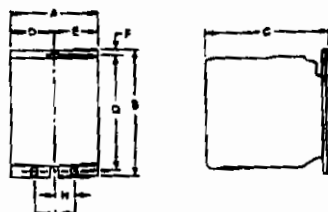


Figure 1
Class 8502

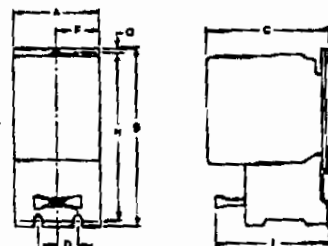


Figure 2
Class 8536

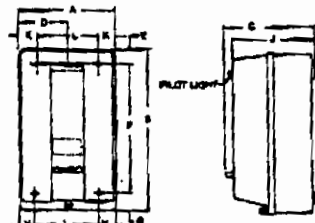


Figure 3

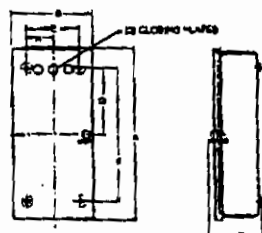


Figure 4

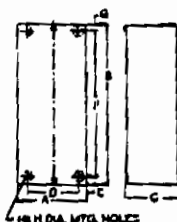


Figure 5

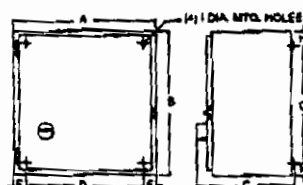


Figure 6

Dimensions for NEMA Type 1 General Purpose Enclosure

NEMA Size	Type	No. of Poles	Fig. No.	Dimensions - inches											
				A	B	C	D	E	F	G	H	I	J	K	L
00	SAG	All	3	6	10	5 1/2	5 1/2	3	7 1/2	8 1/2	1	10 1/2	4 1/2	5	...
0	SBO	All	3	6	10	5 1/2	5 1/2	3	7 1/2	8 1/2	1	10 1/2	4 1/2	5	...
1	SCO	All	3	6	10	5 1/2	5 1/2	3	7 1/2	8 1/2	1	10 1/2	4 1/2	5	...
2	SOC	All	3	7 1/4	12 1/4	6 1/2	6 1/2	...	1 1/2	10 1/2	1 1/2	12 1/2	5 1/4	5 1/4	1 1/2
3	SEO	All	3	11 7/8	21 1/8	8	8 1/2	...	1 1/2	18 1/2	1 1/2	17 1/2	8 1/4	7 1/4	1 1/2
4	SFO	All	6	11 1/4	25 1/2	9	9	...	1 1/2	22 1/2	1 1/2	17 1/2	7 1/4	...	...
5	SGO	All	6	17 1/4	44 7/8	12 1/4	12 1/4	13	2 1/2	2 1/2	40	2 1/2	1 1/2	...	...
6	SHG	All	4	65 1/4	207 1/2	13 1/4	13 1/4	...	11	64 1/2	2 1/2	5 1/2	...	...	...
7	SJG	All	4	83	34 1/2	23 1/2	23 1/2	...	...	...	...	...	...	...	...

Floor Mounting

Dimensions for NEMA Type 1 General Purpose Enclosure with Form F4T

NEMA Size	Type	No. of Poles	Fig. No.	Dimensions - inches									
				A	B	C	D	E	F	G	H	I	J
0	SAG	All	5	6 1/2	15 1/2	5	5 1/2	4 1/2	2 1/2	14 1/2	3 1/2	1 1/2	...
1	SCG	All	5	6 1/2	15 1/2	5	5 1/2	4 1/2	2 1/2	14 1/2	3 1/2	1 1/2	...
2	SDG	All	6	14 1/2	14 1/2	7 1/2	7 1/2	12 1/2	1 1/2	1 1/2	12	1 1/2	5 1/2
3	SEG	2-3	3	Same as Standard NEMA Type 1 Dimensions, see above.									
4	SFG	2-3	6	18 1/2	29 1/2	9 1/2	9 1/2	15 1/2	1 1/2	1 1/2	28 1/2	1 1/2	7 1/2
5	SGG	All	6	Same as Standard NEMA Type 1 Dimensions, see above.									
6	SHG	All	4	Form F4T is supplied as standard. Refer to Page 13-110.									
7	SJG	All	4	Form F4T is supplied as standard. Refer to Page 13-110.									

* Uses 9070 GO Transformer.

SUBMITTAL COVER

PARSONS ENGINEERING SCIENCE, INC. PROJECT NO.

733549.10100

CONTRACTOR:

HASELEY CONSTRUCTION COMPANY, INC.

ADDRESS:

10315 LOCKPORT ROAD, NIAGARA FALLS, NY 14304

PROJECT:

NIAGARA COUNTY REFUSE SITE

SUBMITTAL NO:

49G

DATE OF SUBMITTAL:

01/28/99

TYPE OF SUBMITTAL (CHECK ONE)



Product Data



Schedule



Performance Data



Sample



Warranty



Operations & Maintenance Data



Color Selection



Test Report



Record Document

DESCRIPTION OF SUBMITTAL:

Product Name:

SERVICE METER

Manufacturer:

THOMAS & BETTS

Subcontractor/Supplier:

CIR ELECTRICAL CONSTRUCTION CORP.

Section No.(s):

Drawing No.(s):

E-5

Part/Paragraph:

Detail Reference:

ENGINEER'S APPROVAL

DATE: 2-9-99 KD

FABRICATION MAY NOT PROCEED.

PARSONS ENGINEERING SCIENCE

CONTRACTOR'S APPROVAL STAMP

NIAGARA COUNTY REFUSE SITE
HASELEY CONSTRUCTION CO., INC.

Date:

1/28/99

Item:

SERVICE METER

Specification:

ELECTRICAL

Section:

Para. No.

Drawing No.:

E-5

Page No.

Location:

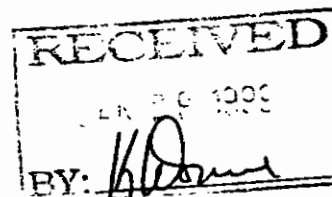
NCCS

Submittal No.

49G

APPROVED BY: WILLIAM L. BEY

RECEIVED STAMPS



Meter Sockets, Power Outlets, and Enclosures

NIAGARA MOHAWK

COMMERCIAL METER SOCKETS

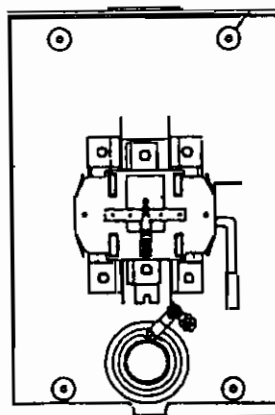
Single Position Socket 200 Ampere

Ordering Information

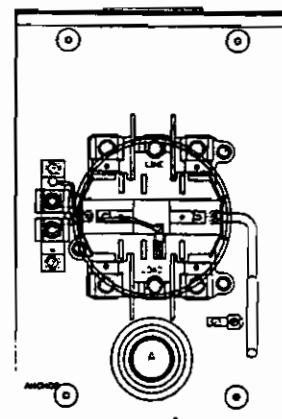
- 5, 7 Terminal
- Ringless Type
- Overhead / Underground
- Clamp Jaw / Lever Bypass
- Hi-Capacity
- Includes Barrel Lock Provision

Standards

UL-414
ANSI C12.7
NIMO



U42552-K2-HO-NM



TB2072-K2-HLO-NM

Application

- 200 ampere continuous duty
- 600 volt – 1 phase, 3 wire; 3 phase, 3 wire; 3 phase, 4 wire
- Grounded neutral
- NEMA 3R

Approved at: Niagara Mohawk

Cat No.	Rating	Service	Hub	Jaws	Bypass	Util. Stock No.	Material	Fig.	Pack	Wt.
U42552-K2-HO-NM	200A	OH	HO	5	Lever	M-089	Steel	1	1	27
U42552-K2-NM	200A	UG	None	5	Lever	M-090	Steel	1	1	28
TB2072-K2-HLO-NM*	200A	OH	HLO	7	Lever	M-101	Steel	2	1	28
TB2072-K2-NM*	200A	UG	None	7	Lever	M-094	Steel	2	1	28

* Formerly known as UD2072 series.

Terminal Information

Rating	Line Lug	Load Lug	Neutral Lug	Ground Lug
200A	6 - 350 MCM	6 - 350 MCM	6 - 350 MCM	8 - 1/2"

Hub Selection Chart

Standard Hubs for HO Devices							Hubs for HLO and HO Devices (Large)						
1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	Closure Plate	2"	2 1/2"	3"	3 1/2"	4"	HLO/HO Adapter	Closure Plate
H1-ANC	H2-ANC	H3-ANC	H4-ANC	H5-ANC	H6-ANC	HP	H20	H25	H30	H35	H40	H7-ANC	H10-ANC

Mounted hub included in catalog number (i.e., H10M).

Meter Sockets, Power Outlets, and Enclosures

NIAGARA MOHAWK

COMMERCIAL METER SOCKETS

Single Position Socket 200 Ampere

Product Specifications

- 5, 7 Terminal
- Ringless
- Overhead / Underground
- Clamp Jaw / Lever Bypass
- Hi-Capacity
- Barrel Lock Provision

Specifications

LINE AND LOAD LUGS – 350 MCM max, Cu-Al.
NEUTRAL – Double 350 MCM max, Cu-Al.
RATING – 200 amperes Continuous Duty, 600 Vac.
5th TERMINAL – Standard (U42552 series).
BYPASS – Clamp jaw/lever bypass.

MOUNTING – Surface, outdoor NEMA 3R.
SEALING RING – None.
HUB OR HUB PLATE – See Hub Chart.
HUB TYPE – Supplied with HO ANSI C12.7 hub opening. 7 Terminal-HLO.

Dimensions

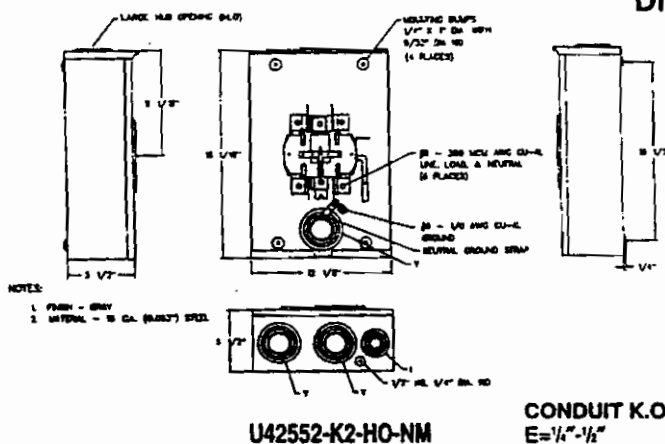


Figure #1

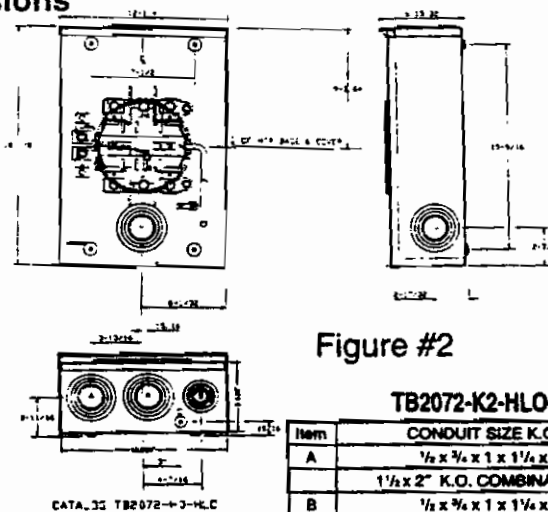


Figure #2

CONDUIT K.O.
 E=1/4"-1/2"
 I=1/4"-1/2"-1"-1 1/4"-1 1/2"-2"
 X=1"-1 1/4"-1 1/2"-2"-2 1/2"
 Y=1 1/4"-1 1/2"-2"-2 1/2"-3"

TB2072-K2-HLO-NM

Item	CONDUIT SIZE K.O.	Qty
A	1/2 x 3/4 x 1 x 1 1/4 x	4
B	1 1/2 x 2" K.O. COMBINATION	2
C	1/2 x 3/4 x 1 x 1 1/4 x	2
	1 1/2" K.O. COMBINATION	2
	1/2" DIA. K.O. (ACTUAL DIA.)	1

Construction Features

INTERIOR – Units are supplied with 5 or 7 terminals/clamp jaw/lever bypass.
CONNECTORS – Made of formed aluminum, age hardened, electro-tin plated to inhibit oxidation and corrosion. Connectors are lay-in type for use with either copper or aluminum conductors.
UD Series = CU.
JAWS – Anchor-patented copper alloy jaw, tin-plated – 7 terminal; HQ7 block.
BLOCKS – The meter jaw mounting block is molded glass-filled polyester with a CTI rating of 190.

ENCLOSURE – 16 ga. zinc-coated steel with gray cathodic epoxy enamel electrocoat finish. Aluminum available.
MOUNTING – Units are supplied with bumps for surface or pole mounting.
COVER/LOCKING PROVISIONS – The hook-lip construction is exclusively used by Anchor. The bumped meter opening assures proper alignment of meter with jaws. The cover is easily installed or removed over the meter. No gaskets required. Positive latch has provisions for sealing wire, padlock seal, or padlock. (Ringless type)

REQUEST FOR INFORMATION

Contractor: HASLEY CONSTRUCTION

Date: 2/2/99
M D Y

RFI No.: 13

Subject: NMPC ELECTRICAL
SERVICE CURRENT RATING

Project: NIAGARA COUNTY REFUSE

Drawing Sheet: E-1

Drawing Description: SINGLE LINE

Division: _____
No. Title

Section: _____
No. Title

Est. Cost Impact: _____

Est. Schedule Impact: _____

Prepared by: P.M. Filiano

Request Response By: 2/9/99
M D Y

Written description of Request - Attach sketches as required:

NMPC SERVICE REQUIREMENTS - NO
AMPERAGE RATING SPECIFIED ON DRAWING.

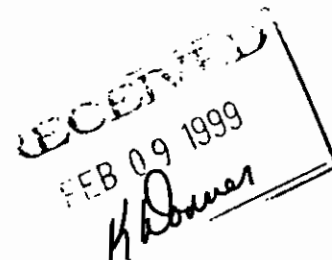
Contractor's Solution: Proposed 200 Amp meter

Engineer's Response: Approved as submitted

By: [Signature]

Date: 2/2/99
M D Y

Distribution:
Contractor HASLEY
Resident Engineer J. COWE
Project Manager R. POPE
Technical Manager J. KYLE



SCIENCE, INC.

LETTER OF TRANSMITTAL

TO

DATE <u>2-2-99</u>	JOB NO. <u>733549</u>
ATTENTION <u>Tom Satarsiero</u>	
RE:	

Haseley Construction Company, Inc.
10315 Lockport Road
Niagara Falls, New York 14304

WE ARE SENDING YOU
THE FOLLOWING ITEMS:

- ☐ Attached ☐ Under separate cover via _____ the following items:
☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of Letter ☐ Change order ☐ _____

Dated _____

COPIES	DATE	NO.	DESCRIPTION
2	2-2-99	49F	MINI-POWER CENTER / CIRCUIT BREAKERS

THESE ARE TRANSMITTED as checked below:

- ☐ For approval ☐ For checking ☒ Resubmit 7 copies for approval
☐ For your use ☐ Approved as submitted ☐ Design only, not for construction
☐ As required ☐ Approved as noted ☐ Return _____ corrected prints
☐ For review and comment ☒ Returned for corrections ☐ _____
☐ For your action

REMARKS: THE MINI POWER CENTER IS OK
THE SPECIFICATION CALLS FOR 30 AMP CIRCUIT
BREAKERS

CLEAN SITES

COPY TO NIAGARA COUNTY
FILE

SIGNED: Kevin Donney

SUBMITTAL COVER

PARSONS ENGINEERING SCIENCE, INC. PROJECT NO.

733549.10100

CONTRACTOR:

HASELEY CONSTRUCTION COMPANY, INC.

ADDRESS:

10315 LOCKPORT ROAD, NIAGARA FALLS, NY 14304

PROJECT:

NIAGARA COUNTY REFUSE SITE

SUBMITTAL NO:

49F

DATE OF SUBMITTAL:

01/28/99

TYPE OF SUBMITTAL (CHECK ONE)



Product Data



Schedule



Performance Data



Sample



Warranty



Operations & Maintenance Data



Color Selection



Test Report



Record Document

DESCRIPTION OF SUBMITTAL:

Product Name:

MINI POWER CENTER / CIRCUIT BREAKERS

Manufacturer:

CUTLER - HAMMER

Subcontractor/Supplier:

CIR ELECTRICAL CONSTRUCTION CORP.

Section No.(s):

16000

Drawing No.(s):

E-6

Part/Paragraph:

2.3

Detail Reference:

ENGINEER'S APPROVAL

CONTRACTOR'S APPROVAL STAMP

SUBMITTAL REVIEWED FOR GENERAL COMPLIANCE WITH CONTRACT DOCUMENTS

DATE:

FABRICATION

MAY 11

22-99 KS

FABRICATION/INSTALLATION/PRODUCTION MAY NOT PROCEED.

PARSONS ENGINEERING SCIENCE

NIAGARA COUNTY REFUSE SITE
HASELEY CONSTRUCTION CO., INC.

Date:

1/28/99

Item:

Mini Power Center / Circuit Breakers

Specification:

ELECTRICAL

Section:

16000

Para. No.

2.3

Drawing No.:

E-6

Page No.

6

Location:

NCS

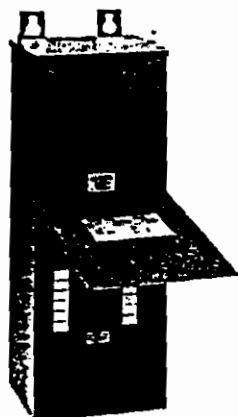
Submittal No. 49F

APPROVED BY: WILLIAM L. BEY

RECEIVED STAMPS

RECEIVED

W. L. Bey



Product Features

- UL listed.
- Indoor-Outdoor, NEMA 3R.
- Primary Main Breaker.
- Secondary Main Breaker (feeder breakers not included).
- All live parts enclosed for personnel safety and equipment protection.
- Cover is hinged to prevent removal and can be padlocked.
- Replaces three individual components – a main breaker, transformer, and panelboard – by combining all three into one unit thus saving space and reducing installation costs.
- Cores are grounded with a copper lead.
- A ground bar is supplied to permit grounding of individual secondary circuits.
- Neutral bar is grounded to case
- A grounding terminal is provided on the case.
- Feeder circuits can be easily added or changed using Type BR plug-in breakers.
- Suitable for service entrance
- Windings and load center chassis are aluminum.

Single-Phase

kVA	Catalog Number	Full Cap. Taps FCBN	Dimensions (Inches) Ⓛ			Weight Lbs.	Dimensions (mm)			Weight kg.	Frame	Wiring Diagram Number	Primary Main Circuit Breaker 2	Secondary Main Circuit Breaker 2	Feeder Breakers 1 & 2 Max. Number		Max. Amp
			H	W	D		H	W	D						1-Pole	2-Pole	

480 Volts to 120/240 Volts

3	P48G11S03P	2-5%	27 1/2	11 7/8	8 7/8	105	698	301	225	47	283	97A	EHD2015	BR215	8	4	12
5	P48G11S05P	2-5%	29 1/2	11 7/8	8 7/8	105	749	301	225	47	284	110A	EHD2020	BR225	12	6	20
7.5	P48G11S07P	2-5%	29 1/2	11 7/8	8 7/8	125	749	301	225	56	284	109A	EHD2030	BR230	12	6	30
10	P48G11S10P	2-5%	32 1/2	13 1/8	11 5/8	177	825	331	295	80	285	108A	EHD2040	BR250	12	6	40
15	P48G11S15P	2-5%	37 1/2	13 1/8	11 5/8	212	946	331	295	96	286	107A	EHD2060	BR270	20	10	60
25	P48G11S25P	2-5%	43 3/8	15 7/8	14 1/2	373	1095	403	368	169	287	106A	EHD2100	BR2125	26	13	100

600 Volts to 120/240 Volts

5	P60G11S05P	2-5%	29 1/2	11 7/8	8 7/8	105	749	301	225	47	284	110B	FDB2015	BR225	12	6	20
7.5	P60G11S07P	2-5%	29 1/2	11 7/8	8 7/8	125	749	301	225	56	284	109B	FDB2030	BR230	12	6	30
10	P60G11S10P	2-5%	32 1/2	13 1/8	11 5/8	177	825	331	295	80	285	108B	FDB2040	BR250	12	6	40
15	P60G11S15P	2-5%	37 1/2	13 1/8	11 5/8	212	946	331	295	96	286	107B	FDB2060	BR270	20	10	60
25	P60G11S25P	2-5%	43 3/8	15 7/8	14 1/2	373	1095	403	368	169	287	106B	FDB2100	BR2125	26	13	100

Three-Phase

kVA	Catalog Number	Full Cap. Taps FCBN	Dimensions (Inches) Ⓛ			Weight Lbs.	Dimensions (mm)			Weight kg.	Frame	Wiring Diagram Number	Primary Main Circuit Breaker 2	Secondary Main Circuit Breaker 2	Feeder Breakers 1 & 2 Max. Number		Max. Amp
			H	W	D		H	W	D						1-Pole	3-Pole	

480 Δ Volts to 208Y/120 Volts

15	P48G28T15P	2-5%	36 1/8	29 7/8	9 3/8	320	915	758	238	145	289	105A	EHD3040	EHD3050	18	6	40
22.5	P48G28T21P	2-5%	40 7/8	29 7/8	13 5/8	565	1038	759	346	256	290	103A	EHD3070	EHD3070	18	6	60
30	P48G28T30P	2-5%	41 7/8	29 7/8	13 5/8	635	1063	759	346	288	291	104A	EHD3090	EHD3100	24	8	80

600 Δ Volts to 208Y/120 Volts

15	P60G28T15P	2-5%	36 1/8	29 7/8	9 3/8	320	915	758	238	145	289	105B	FDB3030	EHD3050	18	6	40
22.5	P60G28T21P	2-5%	40 7/8	29 7/8	13 5/8	565	1038	759	346	256	290	103B	FDB3050	EHD3070	18	6	60
30	P60G28T30P	2-5%	41 7/8	29 7/8	13 5/8	635	1063	759	346	288	291	104B	FDB3070	EHD3100	24	8	80

- Ⓛ Not for construction purposes.
 Ⓛ Main breakers fixed only. No substitutes.
 Ⓛ Combinations can be selected.
 Ⓛ Feeder breakers not included, use Cutler-Hammer Type BR.

NIAGARA CO REFUSE
 P48G11S07P
 BR120
 BR220

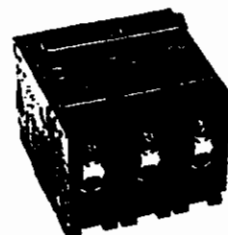
Plug-On Circuit Breakers, Types BR
10,000/22,000/42,000/65,000 Amperes
Interrupting Capacity 120V AC,
120/240V AC and 240V AC



BR120



BR215



BR320

Type BR Breakers, 1-inch (25.4 mm) per Pole 120/240, 10,000, 22,000 and 42,000 AIC^②

Amperes	1-Pole 120/240V AC Requires One 1-Inch Space				2-Pole 120/240V AC Common Trip Requires Two 1-Inch Spaces				Wire Size Range Cu/Al 60°C or 75°C			
	10 per Shelf Carton				5 per Shelf Carton							
	10 kAIC		22 kAIC		10 kAIC		22 kAIC				42 kAIC	
	Catalog Number	List Price	Catalog Number	List Price	Catalog Number	List Price	Catalog Number	List Price			Catalog Number	List Price
10	BR110	\$18.10	—	—	BR215	\$ 41.00	BRH215	\$ 83.00	—	—	#14-4	
15	BR115	18.10	BRH115	\$40.00	BR220	41.00	BRH220	83.00	—	—		
20	BR120	18.10	BRH120	40.00	BR225	41.00	BRH225	83.00	—	—		
25	BR125	18.10	BRH125	40.00	BR230	41.00	BRH230	83.00	—	—		
30	BR130	18.10	BRH130	40.00	—	—	—	—	—	—		
35	—	—	—	—	BR235	41.00	—	—	—	—	#14-4	
40	BR140	18.10	BRH140	40.00	BR240	41.00	BRH240	83.00	—	—		
45	—	—	—	—	BR245	41.00	—	—	—	—		
50	BR150	18.10	BRH150	40.00	BR250	41.00	BRH250	83.00	—	—		
55	—	—	—	—	BR255	39.40	—	—	—	—	#14-3	
60	BR160	18.10	BRH160	40.00	BR260	41.00	BRH260	83.00	BRHH260	\$127.00	#4-1/0	
70	BR170	39.25	BRH170	50.00	BR270	82.00	BRH270	127.00	BRHH270	194.00		
80	—	—	—	—	BR280	118.00	—	—	BRHH280	272.00		
90	—	—	—	—	BR290	118.00	BRH290	160.00	BRHH290	272.00		
100	—	—	—	—	BR2100	118.00	BRH2100	160.00	BRHH2100	272.00		
110	—	—	—	—	BR2110	246.00	BRH2110	590.00	BRHH2110	—		
125	—	—	—	—	BR2125	246.00	BRH2125	590.00	BRHH2125	785.00		
150	—	—	—	—	BR2150	261.00	—	—	—	—	#4-2/0	

Type BR Breakers, 1-Inch (25.4 mm) per Pole 240V AC,
10,000, 22,000 and 42,000 AIC^②

Amperes	3-Pole 240V AC Common Trip Requires Three 1-Inch Spaces					Wire Size Range Cu/Al 60°C or 75°C
	5 per Shelf Carton					
	10 kAIC		22 kAIC			
	Catalog Number	List Price	Catalog Number	List Price		
10	—	—	—	—	#14-4	
15 Δ	BR315E	\$143.00	BRH315E	\$219.00		
20 Δ	BR320E	143.00	BRH320E	219.00		
25	BR325E	143.00	—	—		
30	BR330E	143.00	BRH330E	219.00	#14-4	
35	BR335E	143.00	—	—		
40	BR340E	143.00	BRH340E	219.00		
45	BR345E	143.00	—	—		
50	BR350E	143.00	BRH350E	219.00	#14-3	
55	BR355E	137.00	—	—		
60	BR360E	143.00	BRH360E	219.00		
70	BR370E	143.00	BRH370E	275.00		
80	BR380E	143.00	—	—	#4-1/0	
90	BR390E	143.00	BRH390E	307.00		
100	BR3100E	213.00	BRH3100E	307.00		
110	—	—	—	—		
125	—	—	—	—	#4-2/0	
150	—	—	—	—		

- ① All Type BR 1-, 2-, and 3-pole circuit breakers carry listing for HACR application.
② For circuit breakers with a shunt trip, add ST suffix and obtain pricing from table on page C-24.

- ③ One pole, 1-inch (25.4 mm) per pole circuit breakers are available with high magnetic setting for switching large tungsten lamp loads. Add suffix H to catalog number.
④ Switching duty rated.

- ⑤ For use as a branch circuit breaker in 400 and 600 ampere panels only.
⑥ On the new black handle breaker add suffix B to the catalog number and S4 to the list price to obtain a tapped molded opening for proper use with hold-down kits.

Discount Symbol 22CD



COMMERCIAL • INDUSTRIAL • INSTITUTIONAL • INSTALLATIONS
SERVING BUFFALO AND NIAGARA FALLS

Shop Drawing Submittal

Project: Niagara County Refuse Site
Wheatfield, New York

Contractor: The Haseley Companies
10315 Lockport Road
P.O. Box 212 L.P.O.
Niagara Falls, New York 14304

Sub-Contractor: CIR Electrical Construction Corp.
1067 Harlem Road
Buffalo, New York 14227

Engineer: Conestoga-Rovers & Associates

Date: 01/22/99

Spec. Section

Item

Drawing E7 WET WELL LEVEL FLOAT SWITCHES
16000-9, 2.10

Description

Item: TILT FLOAT SWITCH

Manufacturer: MERCURY

Catalog: #F-BLK-20T Series F

#F-RED-20T Series F





630 Cleveland Dr., Buffalo, NY 14225-1098 • Tel: 716-834-2525 • Fax: 716-834-4082



Representatives & Distributors

ORDER SUBMITTAL

TO: CIR ELECTRICAL DATE January 18, 1999
1067 HARLEM RD. JOB _____
BUFFALO, NY 14227 P.O.# 185
ATTN: GREG JAKUBOWSKI

WE ARE ENCLOSING THE FOLLOWING:

9 SUBMITTALS: FOR RECORD X FOR APPROVAL
 DRAWINGS
 REFERENCE LITERATURE
 INSTRUCTION MATERIAL

FOR YOUR APPROVAL OR COMMENTS:

 APPROVED RE-SUBMIT
 APPROVED AS NOTED INFORMATION
 NOT APPROVED

REMARKS:

PLEASE RETURN ONE (1) SET MARKED APPROVED.

Regards,

Jim Heisler / Gary Schlegel
R.L. STONE CO., INC. /brw
JIM HEISLER/GARY SCHLEGEL

brw

1215 Mt. Read Blvd., Rochester, NY 14606-2817 • Tel: 716-254-2100 • Fax: 716-254-0889
115 Ainsley Dr., Syracuse, NY 13210-4284 • Tel: 315-479-7979 • Fax: 315-479-5402
257 Osborne Rd., Albany, NY 12211-1894 • Tel: 518-459-7900 • Fax: 518-459-0001

SUBMITTAL FOR APPROVAL

PROJECT:

ENGINEER:

CONTRACTOR:

CIR ELECTRICAL

P.O. #

185

SETS SUBMITTED:

9 SETS

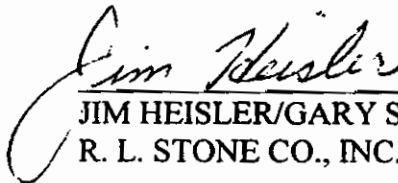
DATE:

1/18/99

**BILL OF MATERIAL
FOR WARRICK CONTROLS**

<u>QUANTITY</u>	<u>DESCRIPTION</u>	<u>REFERENCE</u>
4	Model F-BLK-20T Series F Mercury Tilt Float Switch N.O., 20' flexible cable with wire ties.	Form 230
8	Model F-RED-20T Series F Mercury Tilt Float Switch N.C., 20' flexible cable with wire ties.	Form 230

PLEASE RETURN ONE SET MARKED APPROVED.


JIM HEISLER/GARY SCHLEGEL
R. L. STONE CO., INC.

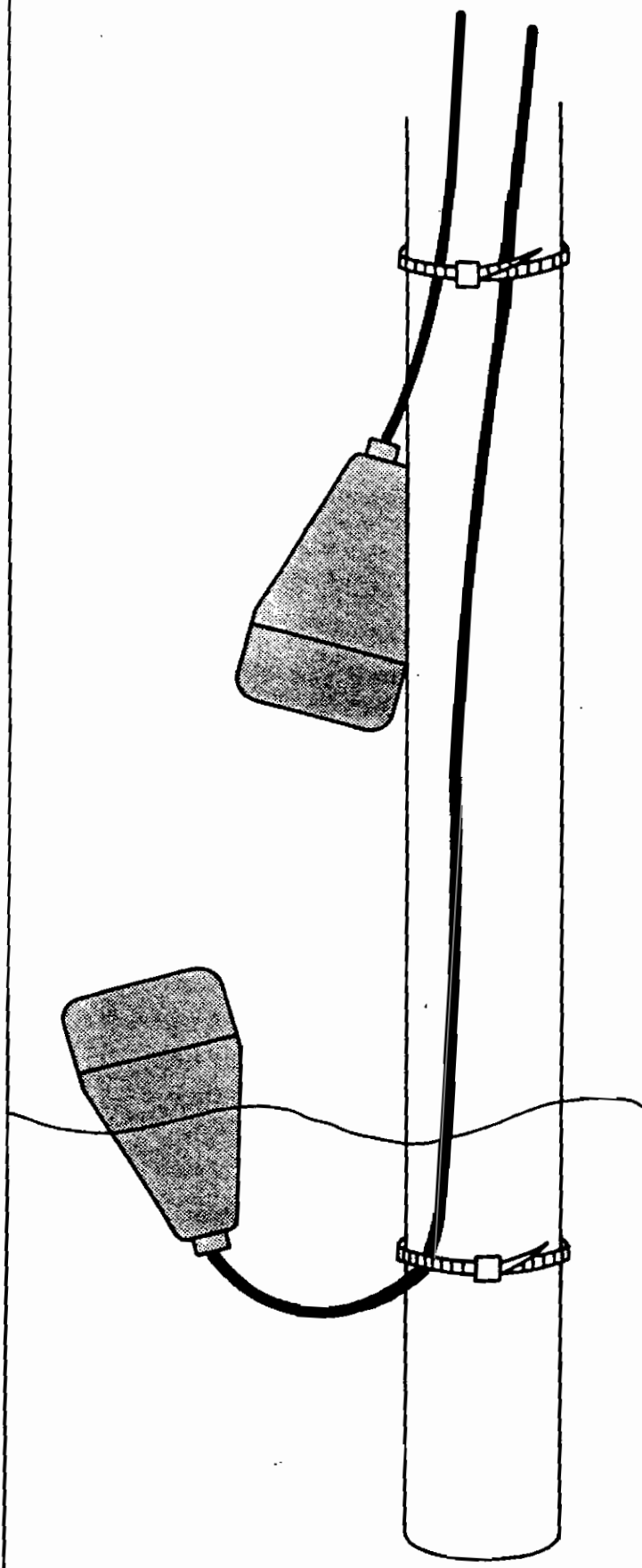
brw

Note: Four additional normally open switches were ordered later by CRA and installed in lieu of four of the above normally closed switches. The four N.C. switches were abandoned in place. (See drawing E-9, as-built Control Panel Schematic Wiring Diagram for locations).

WARRICK CONTROLS

SERIES F

MERCURY TILT FLOAT SWITCH



Applications

Warrick's Mercury Tilt Float Switch is ideal for use in difficult liquids such as in sewage lift stations, slurries, municipal drainage sumps, waste treatment facilities, holding tanks, etc.

Reliability

Our Mercury Tilt Float Switch consists of oil resistant cable securely soldered to a stainless steel mercury capsule which is housed in a durable polypropylene outer shell. The mercury capsule and electrical connections are epoxy potted internally protecting the critical parts from moisture and vibration. The remaining inside of the float is foam filled adding strength and buoyancy under severe conditions.

Flexibility

Warrick offers the Series F for virtually any application. Whether connected to an intrinsically safe control or directly to a pump motor starter, Series F Mercury Tilt Float Switches can be used for level control as well as alarms. Models are available in either normally open or normally closed contacts, with various contact ratings, and cable lengths.

For further information, contact your Warrick Controls representative.

NOTE: If application requires an intrinsically safe circuit, request Bulletin 271.

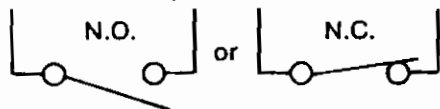


Specifications

Contact Rating*: Models F-BLK-XX-X and F-RED-XX-X, 1 AMP @ 240 VAC or 2 AMP @ 120 VAC. Models F-BLU-XX-X and F-YEL-XX-X, 1/3 HP @ 120 VAC, 20 AMP @ 120 VAC and 10 AMP @ 240 VAC.

Temperature- 0-140° F Ambient

Switch Design- Single pole single throw stainless steel mercury switch.



Cable Type: #16 A.W.G., 2 conductor type SJTO, oil resistant PVC.

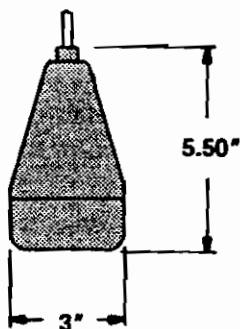
Outer Shell: Impact resistant and corrosion resistant polypropylene.

Internal: Polyurethane foam filled. Chemical resistant hysol epoxy

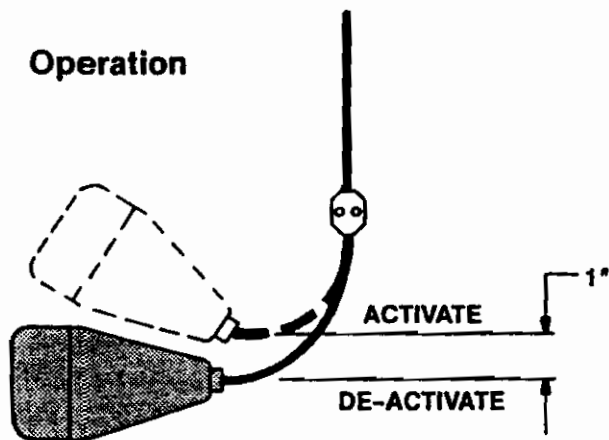
Overall Weight: (Without lead weight)- 2.5 lbs.

*Contact ratings are for resistive loads.

Dimensions



Operation



WARRICK CONTROLS, INC.

4237 Normandy Court (48073)

P.O. Box 460

Royal Oak, Michigan 48068-0460

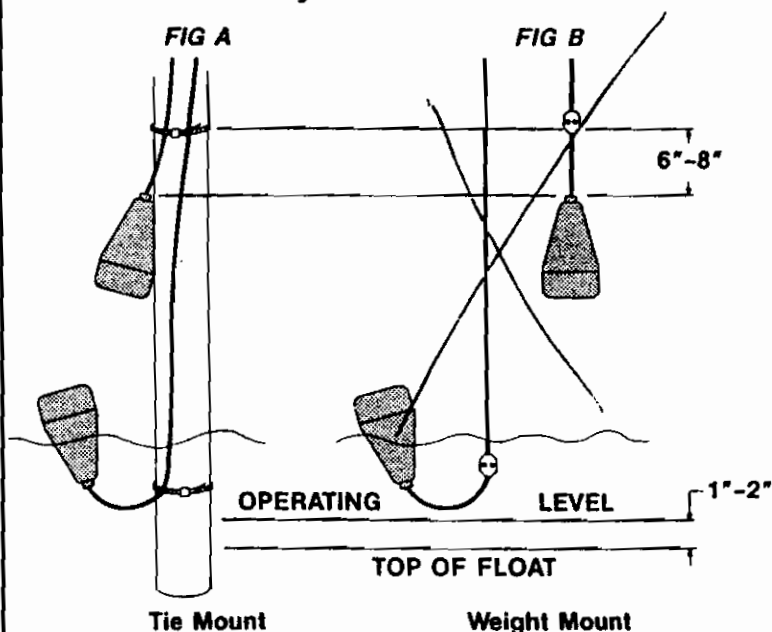
313/545-2512 • Telex: 230454

A Subsidiary of Armstrong International

When level control is absolutely essential.

Installation of Warrick

Series F Mercury Tilt Float Switch



Tie Mount (Fig A)

- 1) To install float using support pipe, locate top of float 1 - 2 inches below desired operating level.
- 2) Attach float cable to pipe 6 - 8 inches above top of float using enclosed wire tie. Be sure the serrations on the tie are on the inside.

Weight Mount (Fig B)

- 1) For weight mount installation, slip slotted tubing over float cable 6 - 8 inches above float.
- 2) Assemble two halves of lead weight around tubing and securely tighten using two self tapping screws. A slight gap may exist between the two halves.
- 3) Hang float from above with top of float 1 - 2 inches below desired operating level.

How To Order

Series F-XXX-XX-X

Mounting

T	Wire Tie
W	Weight

Length

20	20 Feet
40	40 Feet

Contact Design

BLK	1 AMP Normally Open
RED	1 AMP Normally Closed
BLU	10 AMP Normally Open
YEL	10 AMP Normally Closed

Warrick Mercury
Tilt Float Switch

SUBMITTAL COVER

PARSONS ENGINEERING SCIENCE, INC. PROJECT NO. 733549.10100

CONTRACTOR: HASELEY CONSTRUCTION COMPANY, INC.

ADDRESS: 10315 LOCKPORT ROAD, NIAGARA FALLS, NY 14304

PROJECT: NIAGARA COUNTY REFUSE SITE SUBMITTAL NO: 49D

DATE OF SUBMITTAL: 01/28/99

TYPE OF SUBMITTAL (CHECK ONE)

☒ Product Data	☐ Schedule	☐ Performance Data
☐ Sample	☐ Warranty	☐ Operations & Maintenance Data
☐ Color Selection	☐ Test Report	☐ Record Document

DESCRIPTION OF SUBMITTAL:

Product Name: SINGLE POLE TOGGLE SWITCH

Manufacturer: HUBBELL

Subcontractor/Supplier: CIR ELECTRICAL CONSTRUCTION CORP.

Section No.(s): _____ Drawing No.(s): E-6

Part/Paragraph: _____ Detail Reference: _____

ENGINEER'S APPROVAL

SUBMITTAL REVIEWED SOLELY FOR GENERAL COMPLIANCE WITH CONTRACT DOCUMENTS	
DATE:	<u>2-2-99</u> <u>KD</u>
FABRICATION AND INSTALLATION MAY NOT PROCEED	
PARSONS ENGINEERING SCIENCE	

CONTRACTOR'S APPROVAL STAMP

NIAGARA COUNTY REFUSE SITE
HASELEY CONSTRUCTION CO., INC.
Date: 1/28/99
Item: SINGLE POLE TOGGLE
Specification: ELECTRICAL
Section: 1 Para. No. 1
Drawing No. E-6 Page No. 1
Location: NCRS Submittal No. 49D
APPROVED BY: WILLIAM L. BEY

RECEIVED STAMPS

RECEIVED
BY: K. Donner



COMMERCIAL • INDUSTRIAL • INSTITUTIONAL • INSTALLATIONS
SERVING BUFFALO AND NIAGARA FALLS

Shop Drawing Submittal

Project: Niagara County Refuse Site
Wheatfield, New York

Contractor: The Haseley Companies
10315 Lockport Road
P.O. Box 212 L.P.O.
Niagara Falls, New York 14304

Sub-Contractor: CIR Electrical Construction Corp.
1067 Harlem Road
Buffalo, New York 14227

Engineer: Conestoga-Rovers & Associates

Date: 01/18/99

<u>Spec. Section</u>	<u>Item</u>

Drawing E6	SINGLE POLE TOGGLE SWITCH

<u>Description</u>

Item: 20 AMP, 120 VAC
Manufacturer: HUBBELL
Catalog: #1221-BK AND #6080 BOX

Manufacturer: MULBERRY
Catalog: #95071 COVER

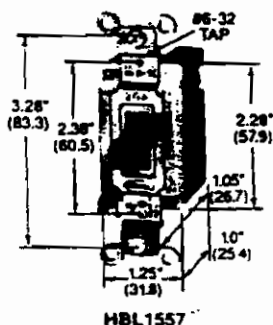
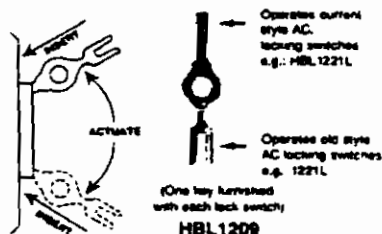
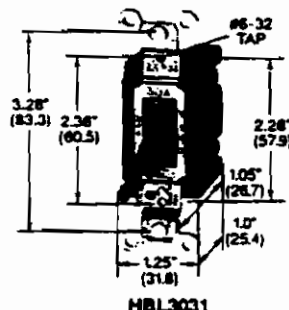
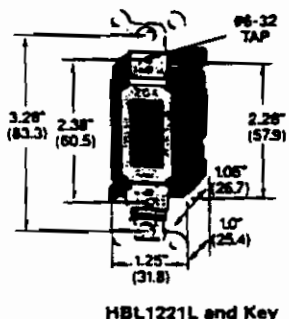
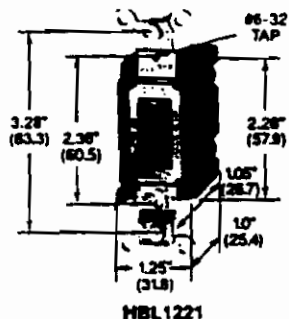


AC Switches

15, 20 and 30 Ampere, 120-277 Volt AC

Industrial-Institutional, Heavy Duty Specification Grade
Toggle and Lock Type AC Switches with Ground Screw

NEW



Specification Grade AC Switches, Back and Side Wired 15A, 120-277V AC

Description	Catalog Numbers			
	Single Pole	Double Pole	Three Way	Four Way
Brown nylon toggle.	HBL1201	HBL1202	HBL1203	HBL1204
Ivory nylon toggle.	HBL1201I	HBL1202I	HBL1203I	HBL1204I
Gray nylon toggle.	HBL1201GY	-	HBL1203GY	HBL1204GY
White nylon toggle.	HBL1201W	-	-	-
Red nylon toggle.	HBL1201R	-	-	-
Lock type.	HBL1201L	HBL1202L	HBL1203L	HBL1204L
Key for lock switches.	HBL1209			

20A, 120-277V AC

Description	Catalog Numbers			
	Single Pole	Double Pole	Three Way	Four Way
Brown nylon toggle.	HBL1221	HBL1222	HBL1223	HBL1224
Ivory nylon toggle.	HBL1221I	HBL1222I	HBL1223I	HBL1224I
Gray nylon toggle.	HBL1221GY	HBL1222GY	HBL1223GY	HBL1224GY
White nylon toggle.	HBL1221W	HBL1222W	HBL1223W	HBL1224W
Red nylon toggle.	HBL1221R	HBL1222R	HBL1223R	HBL1224R
Black nylon toggle.	HBL1221BK	HBL1222BK	HBL1223BK	HBL1224BK
Lock type.	HBL1221L	HBL1222L	HBL1223L	HBL1224L
Key for lock switches.	HBL1209			

30A, 120-277V AC

Description	Catalog Numbers		
	Single Pole	Double Pole	Three Way
Brown nylon toggle.	HBL3031	HBL3032	HBL3033
Ivory nylon toggle.	HBL3031I	HBL3032I	HBL3033I

Momentary Contact, Specification Grade, Back and Side Wired Three Position—Two Circuit Momentary Contact, Center Off

Description	Catalog Numbers	
	15A, 120-277V AC	20A, 120-277V AC
Brown nylon toggle.	HBL1556	HBL1557
Ivory nylon toggle.	HBL1556I	HBL1557I
Gray nylon toggle.	HBL1556GY	HBL1557GY
White nylon toggle.	-	HBL1557W
Lock type.	HBL1556L	HBL1557L
Key for lock switches.	HBL1209	

Notes: Keys are supplied with each lock switch. For extra keys order HBL1209.
For technical data see page C-21.
See Section D for wall plates. For accessories see pages C-18 to C-20.
See pages C-26 and C-27 for wiring diagrams.

HP Conversion Chart

	120V	240V
15A	1 HP	2HP
20A	1½ HP	2HP
30A	2HP	2HP

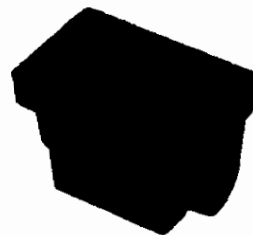
Marine Products

Marine Grade Dockside Boxes & Covers

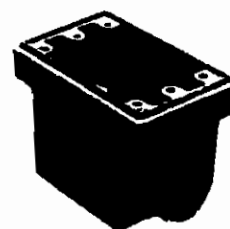
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Marine Grade Dockside Boxes & Covers

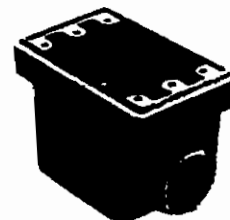
Description	Catalog Number
Black phenolic type FD (deep) weatherproof box has two $\frac{1}{4}$ " (19.1) I.P.S. molded-in knockouts. $4\frac{1}{8}$ " H x $2\frac{5}{8}$ " W x $3\frac{1}{4}$ " D (115.9H x 74.6W x 82.6D) and has 22 cubic inch capacity.	6080
Yellow fiberglass type FD (deep) weatherproof box has two $\frac{3}{4}$ " (19.1) I.P.S. molded-in knockouts. $4\frac{1}{8}$ " H x $2\frac{5}{8}$ " W x $3\frac{1}{4}$ " D (115.9H x 74.6W x 82.6D) and has 22 cubic inch capacity.	60CM83
Yellow fiberglass type FD box same as #60CM83-except has two 1" (25.4) I.P.S. molded-in knockouts.	60CM84
Black phenolic type FS (shallow) weatherproof box has two $\frac{3}{4}$ " (19.1) I.P.S. molded-in knockouts. $4\frac{1}{8}$ " H x $2\frac{5}{8}$ " W x $2\frac{3}{8}$ " D (115.9H x 74.6W x 55.6D) and has 16 cubic inch capacity.	6080OS
Black phenolic type FS weatherproof box for use with telephone and TV dockside receptacles. PVC adapter and cord connector included.	PH6619
Black phenolic junction box with four $\frac{3}{4}$ " (19.1) I.P.S. molded-in knock-outs. Has $4\frac{1}{4}$ " (104.8) diameter and is $1\frac{1}{4}$ " (47.6) deep.	6081
$\frac{1}{4}$ " (6.4) thick phenolic blank cover for #6081 box.	6082
Black phenolic black cover plate for #6080-OS.	6087
Yellow fiberglass blank cover plate for use with FS and FD type boxes.	60CM88



6080



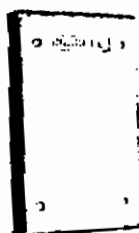
60CM83



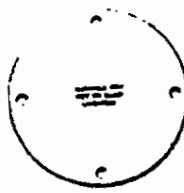
60CM84



6080OS

6087
60CM88

6081



6082



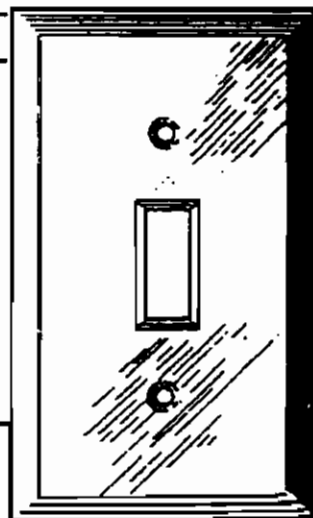
PH6619

ALUMINUM, SOLID BRASS AND STAINLESS STEEL

Architectural

For color photos of finishes see
inside front cover.

STANDARD SHAPE



See page A84 for
ordering Custom Plates
not found in this listing.

	ALUMINUM (.040")	ALUMINUM (.050")	POLISHED BRASS (.040")	POLISHED STAINLESS	STAINLESS TYPE 302 (.060")	SATIN BRASS (.040")	SATIN BRASS (.060")
	Satin Finish (SAL)	Clear Anodized (5AA)	High Polish U.S. #3 (4PB)	High Polish U.S. #32 (302SP)	Satin Finish U.S. #32D (302SS)	Satin Finish U.S. #4 (4BB)	Satin Finish U.S. #4 (6BB)
1 Toggle Switch (1T)	62071	95071	64071	68071	70071	94071	98071
2 Toggle Switches (2T)	62072	95072	64072	68072	70072	94072	98072
3 Toggle Switches (3T)	62073	95073	64073	68073	70073	94073	98073
4 Toggle Switches (4T)	62074	95074	64074	68074	70074	94074	98074
5 Toggle Switches (5T)	62075	95075	64075	68075	70075	94075	98075
6 Toggle Switches (6T)	62076	95076	64076	68076	70076	94076	98076
7 Toggle Switches (7T)	62077	95077	64077	68077		94077	
8 Toggle Switches (8T)	62078	95078	64078	68078		94078	
9 Toggle Switches (9T)	62079	95079	64079	68079		94079	
10 Toggle Switches (10T)	62080	95080	64080	68080		94080	
1 Duplex Receptacle (10DR)	62101	95101	64101	68101	70101	94101	98101
2 Duplex Receptacles (20DR)	62102	95102	64102	68102	70102	94102	98102

SUBMITTAL COVER

PARSONS ENGINEERING SCIENCE, INC. PROJECT NO.

733549.10100

CONTRACTOR:

HASELEY CONSTRUCTION COMPANY, INC.

ADDRESS:

10315 LOCKPORT ROAD, NIAGARA FALLS, NY 14304

PROJECT:

NIAGARA COUNTY REFUSE SITE

SUBMITTAL NO:

49C

DATE OF SUBMITTAL:

01/28/99

TYPE OF SUBMITTAL (CHECK ONE)



Product Data



Schedule



Performance Data



Sample



Warranty



Operations & Maintenance Data



Color Selection



Test Report



Record Document

DESCRIPTION OF SUBMITTAL:

Product Name:

DUPLEX RECEPTICAL

Manufacturer:

HUBBELL

Subcontractor/Supplier:

CIR ELECTRICAL CONSTRUCTION CORP.

Section No.(s):

Drawing No.(s):

E-6

Part/Paragraph:

Detail Reference:

ENGINEER'S APPROVAL

SUBMITTAL REVIEWED SOLELY
FOR GENERAL COMPLIANCE
WITH CITY OF NIAGARA FALLS
REQUIREMENTS

DATE/BY

2-2-99 KD

FABRICATOR

MADE IN

FABRICATOR'S LOCATION

MAY NOT PROCEED

PARSONS ENGINEERING SCIENCE

CONTRACTOR'S APPROVAL STAMP

NIAGARA COUNTY REFUSE SITE
HASELEY CONSTRUCTION CO., INC.

Date: 1/20/99

Item: DUPLEX RECEPTICAL

Specification: ELECTRICAL

Section: — Para. No. —

Drawing No. E-6 Page No. —

Location: NCRS Submittal No. 49C

APPROVED BY: WILLIAM L. BEY

RECEIVED STAMPS

RECEIVED

BY: [Signature]



COMMERCIAL • INDUSTRIAL • INSTITUTIONAL • INSTALLATIONS
SERVING BUFFALO AND NIAGARA FALLS

Shop Drawing Submittal

Project: Niagara County Refuse Site
Wheatfield, New York

Contractor: The Haseley Companies
10315 Lockport Road
P.O. Box 212 L.P.O.
Niagara Falls, New York 14304

Sub-Contractor: CIR Electrical Construction Corp.
1067 Harlem Road
Buffalo, New York 14227

Engineer: Conestoga-Rovers & Associates

Date: 01/18/99

<u>Spec. Section</u>	<u>Item</u>

Drawing E6	DUPLEX RECEPTACLE

<u>Description</u>

Item: 20 AMP, 125 VOLT, 3-WIRE, GROUNDED
Manufacturer: HUBBELL
Catalog: #53CM62 AND #6080 BOX

Manufacturer: MULBERRY
Catalog: #95101 COVER



Marine Products
20 Ampere, 125 Volt
 2 Pole 3 Wire
Straight Blade Devices



Plugs and covers only.

IP20

SUITABILITY Plugs and connectors only.



20A 125V

20A 125V Straight Blade Devices

Description	Catalog Number
Yellow Insulgr [®] plug has rugged nylon housing and detachable cord grip with range of .296-.687" (7.5-17.4) that utilizes unique offset jaws arrangement for secure strain relief.	53CM66C
Yellow Insulgr [®] connector body has rugged nylon housing and detachable cord grip with range of .296-.687" (7.5-17.4) that utilizes unique offset jaws arrangement for secure strain relief.	53CM69C
Yellow Seal-Tite [®] cover for weatherproofing straight blade Insulgr [®] connector bodies, #53CM69C and #52CM69C, on extension cords and adapters. IP55 SUITABILITY. <i>Note: Fits Insulgr[®] devices only.</i>	60CM18
Yellow closure plug used with #60CM18 long Seal-Tite cover to prevent water from entering front of device when not in use.	60CM19
Yellow Seal-Tite cover for weatherproofing straight blade Insulgr [®] plugs, #53CM66C and #52CM66C, when used to mate receptacles and connector bodies. Can also be used with Insulgr [®] connector bodies when mating with flanged inlets. IP55 SUITABILITY. <i>Note: Fits Insulgr[®] devices only.</i>	60CM17
Yellow Valise [®] plug has one-piece nylon housing that assembles easily with two screws. Built-in cord grip has range of .460-.720" (11.7-18.2).	53CM66V
Yellow Valise connector body has one-piece nylon housing that assembles easily with two screws. Built-in cord grip has range of .460-.720" (11.7-18.2).	53CM69V
Yellow duplex receptacle has heat resistant melamine body. Receptacle accepts both 20A 125V and 15A 125V 2 pole, 3 wire straight blade plugs.	53CM62
Single version of #53CM62 duplex yellow receptacle.	53CM61
Compact gray nylon panel mount outlet ideal for electric trolling motors and reel applications. Features gasketed spring-loaded lift cover for weatherproofing front and neoprene boot for weatherproofing rear. Accepts both 20A 125V and 15A 125V 2 pole, 3 wire straight blade plugs.	61CM65
Yellow polycarbonate spring-loaded lift cover plate for weatherproofing duplex receptacles. Stainless steel screws and neoprene gasket included. For mounting to standard outlet boxes. IP44 SUITABILITY.	52CM22*
Same as #52CM22 except gray in color. IP44 SUITABILITY.	5222*
Same as #52CM22; except for mounting to FS/FD type weatherproof boxes. IP44 SUITABILITY.	52CM21
Same as #52CM21 except gray in color. IP44 SUITABILITY.	5221*
Yellow polycarbonate spring-loaded lift cover plate for weatherproofing single straight blade receptacles. Stainless steel screws and neoprene gasket included. For mounting to FS/FD type weatherproof boxes. IP44 SUITABILITY.	74CM23WO
Same as #74CM23WO except gray in color.	7423WO

*Not shown.

See general Technical Section for IP definition.



53CM66C



53CM69C



60CM18
60CM19



60CM17



53CM66V



53CM69V



53CM62



53CM61



52CM21
5221



74CM23WO
7423WO



61CM65



Marine Products

Marine Grade Dockside Boxes & Covers

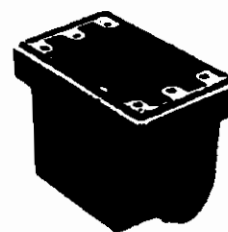
(Continued)

Marine Grade Dockside Boxes & Covers

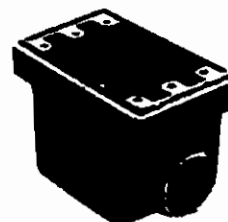
Description	Catalog Number
Black phenolic type FD (deep) weatherproof box has two 1/4" (19.1) I.P.S. molded-in knockouts. 4 1/8" H x 2 5/8" W x 3 1/4" D (115.9H x 74.6W x 82.6D) and has 22 cubic inch capacity.	6080
Yellow fiberglass type FD (deep) weatherproof box has two 1/4" (19.1) I.P.S. molded-in knockouts. 4 1/8" H x 2 5/8" W x 3 1/4" D (115.9H x 74.6W x 82.6D) and has 22 cubic inch capacity.	60CM83
Yellow fiberglass type FD box same as #60CM83-except has two 1" (25.4) I.P.S. molded-in knockouts.	60CM84
Black phenolic type FS (shallow) weatherproof box has two 1/4" (19.1) I.P.S. molded-in knockouts. 4 1/8" H x 2 5/8" W x 2 3/8" D (115.9H x 74.6W x 55.6D) and has 16 cubic inch capacity.	6080OS
Black phenolic type FS weatherproof box for use with telephone and TV dockside receptacles. PVC adapter and cord connector included.	PH6619
Black phenolic junction box with four 1/4" (19.1) I.P.S. molded-in knock-outs. Has 4 1/4" (104.8) diameter and is 1 3/4" (47.6) deep.	6081
1/4" (6.4) thick phenolic blank cover for #6081 box.	6082
Black phenolic black cover plate for #6080-OS.	6087
Yellow fiberglass blank cover plate for use with FS and FD type boxes.	60CM88



6080



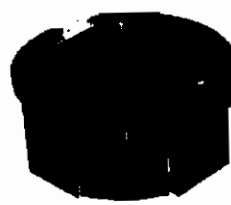
60CM83



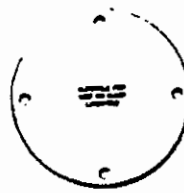
60CM84



6080OS

6087
60CM88

6081



6082



PH6619

Marine Products

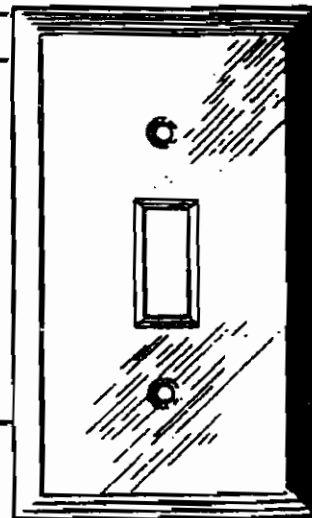
Boxes and Covers

ALUMINUM, SOLID BRASS AND STAINLESS STEEL

Architectural

For color photos of finishes see
inside front cover.

STANDARD SHAPE



See page A84 for
ordering Custom Plates
not found in this listing.

	ALUMINUM (.040") Satin Finish (SAL)	ALUMINUM (.050") Clear Anodized (5AA)	POLISHED BRASS (.040") High Polish U.S. #3 (4PB)	POLISHED STAINLESS High Polish U.S. #32 (302SP)	STAINLESS TYPE 302 (.060") Satin Finish U.S. #32D (3026SS)	SATIN BRASS (.040") Satin Finish U.S. #4 (4BB)	SATIN BRASS (.060") Satin Finish U.S. #4 (6BB)
1 Toggle Switch (1T)	62071	95071	64071	68071	70071	94071	98071
2 Toggle Switches (2T)	62072	95072	64072	68072	70072	94072	98072
3 Toggle Switches (3T)	62073	95073	64073	68073	70073	94073	98073
4 Toggle Switches (4T)	62074	95074	64074	68074	70074	94074	98074
5 Toggle Switches (5T)	62075	95075	64075	68075	70075	94075	98075
6 Toggle Switches (6T)	62076	95076	64076	68076	70076	94076	98076
7 Toggle Switches (7T)	62077	95077	64077	68077		94077	
8 Toggle Switches (8T)	62078	95078	64078	68078		94078	
9 Toggle Switches (9T)	62079	95079	64079	68079		94079	
10 Toggle Switches (10T)	62080	95080	64080	68080		94080	
1 Duplex Receptacle (100R)	62101	95101	64101	68101	70101	94101	98101
2 Duplex Receptacles (200R)	62102	95102	64102	68102	70102	94102	98102

SUBMITTAL COVER

PARSONS ENGINEERING SCIENCE, INC. PROJECT NO. 733549.10100

CONTRACTOR: HASELEY CONSTRUCTION COMPANY, INC.

ADDRESS: 10315 LOCKPORT ROAD, NIAGARA FALLS, NY 14304

PROJECT: NIAGARA COUNTY REFUSE SITE SUBMITTAL NO: 49B

DATE OF SUBMITTAL: 01/28/99

TYPE OF SUBMITTAL (CHECK ONE)

☒ Product Data	☐ Schedule	☐ Performance Data
☐ Sample	☐ Warranty	☐ Operations & Maintenance Data
☐ Color Selection	☐ Test Report	☐ Record Document
☐		

DESCRIPTION OF SUBMITTAL:

Product Name: 3-POSITION SELECTOR SWITCH

Manufacturer: ALLEN-BRADLEY

Subcontractor/Supplier: CIR ELECTRICAL CONSTRUCTION CORP.

Section No.(s): _____ Drawing No.(s): E-6

Part/Paragraph: _____ Detail Reference: _____

ENGINEER'S APPROVAL

2-2-99 KD

PARSONS ENGINEERING SCIENCE

CONTRACTOR'S APPROVAL STAMP

NIAGARA COUNTY REFUSE SITE
HASELEY CONSTRUCTION CO., INC.

Date: _____

Item: 3-Position Switch

Specification: ELECTRICAL

Section: 1 Para. No. 1

Drawing No.: E-6 Page No. 1

Location: NCRS Submittal No. 49B
APPROVED BY: WILLIAM L. BEY

RECEIVED STAMPS

RECEIVED

BY: W. L. Bey



COMMERCIAL • INDUSTRIAL • INSTITUTIONAL • INSTALLATIONS
SERVING BUFFALO AND NIAGARA FALLS

Shop Drawing Submittal

Project: Niagara County Refuse Site
Wheatfield, New York

Contractor: The Haseley Companies
10315 Lockport Road
P.O. Box 212 L.P.O.
Niagara Falls, New York 14304

Sub-Contractor: CIR Electrical Construction Corp.
1067 Harlem Road
Buffalo, New York 14227

Engineer: Conestoga-Rovers & Associates

Date: 01/15/99

Spec. Section

Item

Drawing E6 3-POSITION SELECTOR SWITCH

Description

Item: 3-Position Selector Switch

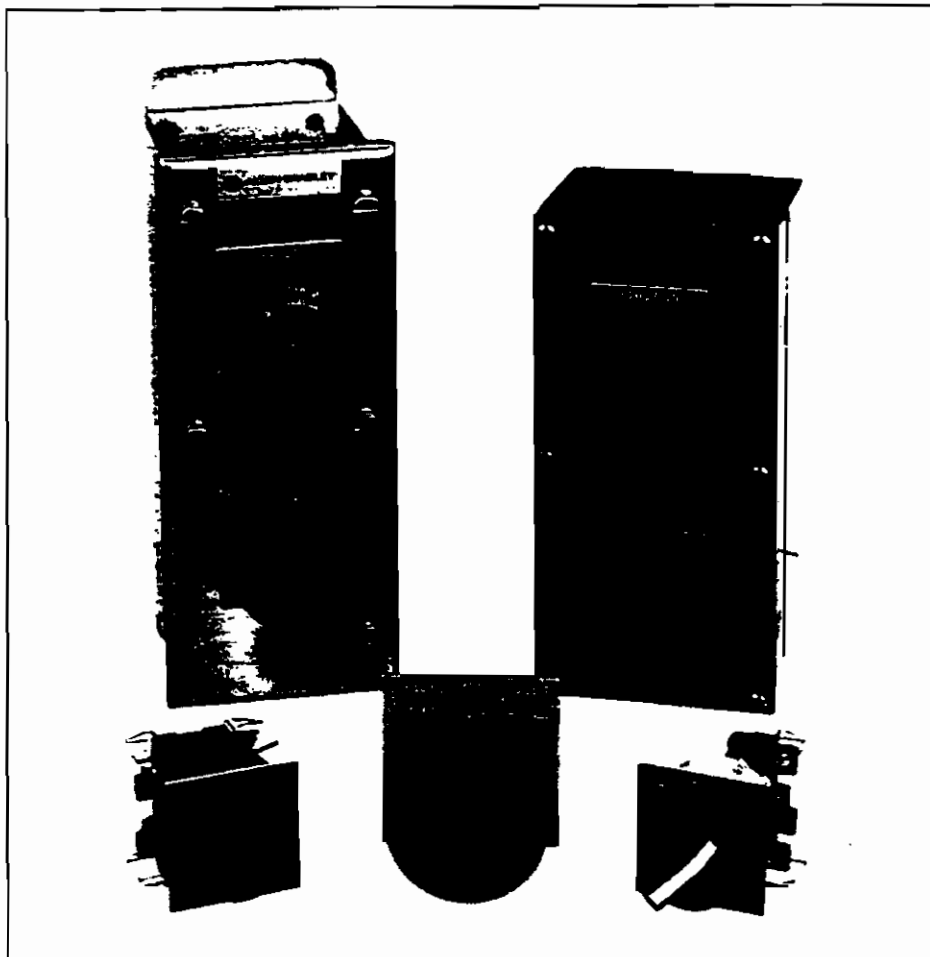
Manufacture: Allen-Bradley

Catalog: #800H-R3HA4RL



NEMA Style Push Buttons

30.5mm NEMA Type 4/4X, Corrosion-Resistant

**Bulletin 800H****NEMA Style****30.5mm
Mounting Hole****NEMA Type 4/4X
Corrosion-Resistant****Heavy Industrial
Operators****TABLE OF CONTENTS**

Description	Page	Description	Page
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2 Position Push-Pull/Twist	7-64	Power Modules	7-76
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Potentiometer	7-70		

NEMA Style Push Buttons

30.5mm NEMA Type 4/4X, Corrosion-Resistant

Technical Data ①

ELECTRICAL RATINGS

Contact Ratings

Refer to the Contact Ratings tables to the right.

Dielectric Strength

2200 Volts for one minute; 1300V for one minute – Logic Reed

Electrical Design Life Cycles

1,000,000 at maximum rated load

MECHANICAL RATINGS

Vibration

10-2000 Hz 1.52mm displacement (peak-to-peak) Max./10G Max.
(except Logic Reed)

Shock

1/2 cycle sine wave for 11 milliseconds $\geq$ 25G (contact fragility) and no damage at 100G

Degree of Protection

NEMA Type 4/4X; Watertight/Corrosion-Resistant IEC 529 IP 66/65

Mechanical Design Life Cycles

Push Buttons: 1,000,000 minimum

Potentiometers: 100,000 minimum

All other devices: 200,000 minimum

Contact Operation

Shallow & Mini Contact Blocks: Slow, double make and break

Typical Operating Forces

Operators without contact blocks:

Flush, Extended, Standard Mushroom, Jumbo Plastic Mushroom: 2 lbs. Max.

Maintained Selector Switch: 3.6 in. lbs. maximum

Spring Return Selector Switches:

3.6 in. lbs. to stop

0.2 in. lbs. to return

Illuminated Push Buttons and Push-to-Test Pilot Lights: 5 lbs. maximum

3 Position Push-Pull:

8 lbs. maximum push to in position or pull to center position (15 lbs. maximum pull to out position)

Push-Pull and Push-Pull/Twist:

9 lbs. maximum push or pull

30 in. oz. maximum twist, 6 in. oz. minimum return

Contact Blocks:

800T-XA: 1 lb.

Logic Reed: 1 lb. maximum

Sealed Switch: 3 lbs. maximum at 0.205" plunger travel

ENVIRONMENT

Temperature Range

Operating: +32°F to +131°F (0°C to +55°C)

Storage: -40°F to +185°F (-40°C to +85°C)

Note: Operating temperatures at 0°C are based on the absence of freezing moisture and liquids.

Humidity

50% at +104°F (+40°C)

① Performance Data — See Page General-2.

Contact Ratings

(IEC 337-1) (NEMA ICS 2-125) Maximum continuous current I_{th} 10 Amperes. Bulletin 800H units have control circuit ratings with 800T-XA contact blocks as follows:

Max. Opern'l. Volts Ue	Utilization Category		Rated Operational Currents		
	IEC	NEMA	Volts Ue	Make	Break
AC 600	AC-II	A600	120-600	7200VA	720VA
			72-120	60A	720VA
			24-72	60A	10A
DC 600	DC-II	P600	28-600 24-28 ②	138VA 5.0A	

② For applications below 24V and 24 milliamps. Logic Reed contacts are recommended.

Sealed Switch Contact Ratings

Maximum continuous current I_{th} 5 Amperes. Bulletin 800H units have control circuit ratings with sealed switch contact blocks as follows:

Max. Opern'l. Volts Ue	Utilization Category		Rated Operational Currents		
	IEC	NEMA	Volts Ue	Make	Break
AC 600	AC-II	B600	120-600	3600VA	360VA
			0-120	30A	3A
DC 300	DC-II	P300	24-300 0-24	138VA 5.0A	

Logic Reed Contact Ratings

Maximum: 150V AC, 0.15 amps, 8VA and 30V DC, 0.06 amps, 1.8VA. Should only be used with resistive loads.

Approvals

UL Listed – File: E14840, E10314

Guide: NKCR, NOIV

CSA Certified: LR1234, LR11924

IEC Compliance

Materials Used In 800H NEMA Type 4X

Thermoplastic Polyester (Fiberglass Reinforced)

- Bushings
- Mounting Rings
- Sockets

Thermoplastic Polyester

- Non-Illuminated Button Caps

Transparent Amorphous Nylon

- Pilot Light Lens Cap
- Illuminated Button Caps

Glass Filled Crystalline Nylon

- Thrust Washer

Mineral Filled Nylon

- Trim Washer

Nitrile (Synthetic Rubber)

- Gaskets and Internal Seals

NEMA Style Push Buttons

30.5mm NEMA Type 4/4X, Corrosion-Resistant

Complete Assembled Stations, Non-Metallic NEMA Type 4/4X

Legend Plates – Page 7-82

Dimensions – Page 7-86



Booted Operator Station
Catalog Number 800H-1HA4R



Bootless Operator Station
Catalog Number 800H-1HA4RL

Operator	Contact Symbol	Button Type/ Color	Legend Marking	ROSITE Glass Polyester Enclosures			
				Booted Operator Station		Bootless Operator Station	
				Catalog Number	Prc.	Catalog Number	Prc.
One Push Button		Flush/Green	START	800H-1HB4R	\$109	800H-1HB4RL	\$ 97
		Extended/Red	STOP	800H-1HA4R	109	800H-1HA4RL	97
		Mushroom/Red	EMERGENCY STOP	800H-1HK4R	—	800H-1HK4RL	11
		Flush/Black	No Legend	800H-1HX4R	106	800H-1HX4RL	94
Two Push Buttons		Flush/Green Extended/Red	START STOP	800H-2HA4R	158	800H-2HA4RL	134
		Flush/Black Flush/Black	No Legends	800H-2HX4R	152	800H-2HX4RL	122
One Pilot Light Two Push Buttons		Red 120V AC/DC Flush/Green Extended/Red	No Legend START STOP	800H-2HAR4R	246	800H-2HAR4RL	222
		Red 120V AC/DC Flush/Black Flush/Black	No Legends	800H-2HXR4R	240	800H-2HXR4RL	210
3 Position Selector Switch		Maintained	HAND OFF AUTO	—	—	800H-R3HA4RL	10
		Maintained	No Legend	—	—	800H-R3HX4RL	10
One Push Button Maintained		Push-Pull/Twist Red	EMERGENCY STOP	—	—	800H-1HAM4R	—
Two Push Buttons Maintained		Flush/Green Extended/Red	START STOP	800H-2HAM4R	158	800H-2HAM4RL	—
		Flush/Black Flush/Black	No Legends	800H-2HXM4R	152	800H-2HXM4RL	—

Bulletin 800H
NEMA Style Push Buttons
30.5mm NEMA Type 4/4X, Corrosion-Resistant

Pre-Assembled Stations, Non-Metallic NEMA Type 4/4X

800H-⁰ 3H A 4R
a b c d e

a		
No. of Push Buttons		
Booted		
Description		Price
1 Operator		\$ 48
2 Operator		92
3 Operator		138
Bootless		
Description		Price
1 Operator		\$ 34
2 Operator		68
3 Operator		102
2 Position Selector Switch		40
3 Position Selector Switch		40

b		
Legend Marking		
1 Push Button		
Description		Price
TOP (Red)		\$ 3
START (Green)		3
JOG		3
EMERGENCY STOP		21
No Legend		-
2 Push Button		
Description		Price
START STOP		\$6
FORWARD REVERSE		6
RAISE LOWER		6
OPEN CLOSE		6
JOG STOP		6
No Legend		6

b (cont'd)		
Legend Marking		
3 Push Button		
Code	Description	Price
A	FORWARD REVERSE STOP	\$9
C	UP DOWN STOP	9
D	OPEN CLOSE STOP	9
F	FAST SLOW STOP	9
G	START JOG STOP	9
X	No Legend	-
2 Position Selector		
Code	Description	Price
A	HAND AUTO	\$3
B	FORWARD REVERSE	3
C	OFF ON	3
G	OPEN CLOSE	3
X	No Legend	-
3 Position Selector		
Code	Description	Price
A	HAND OFF AUTO	\$3
B	FORWARD REVERSE STOP	3
G	OPEN OFF CLOSE	3
X	No Legend	-
2 Push Button/1 Pilot Light		
Code	Description	Price
A	START STOP	\$6
X	No Legend	-
3 Push Button/1 Pilot Light		
Code	Description	Price
A	FORWARD SLOW STOP	\$6
F	FAST SLOW	6
X	No Legend	-

b (cont'd)		
Legend Marking		
2 Button Maintained Contacts		
Code	Description	Price
AM	START STOP	\$6
CM	OFF ON	6
GM	OPEN CLOSE	6
JM	RUN STOP	6
KM	JOG RUN	6
LM	HAND AUTO	6
XM	No Legend	-
1 Button Maintained Contacts		
Code	Description	Price
AM	EMERGENCY STOP	\$3

c		
Pilot Light		
Code	Description	Price
Blank	No Pilot Lights	\$ -
1R	1 Red 120V AC/DC	52
1P	1 Red 240V AC/DC	52
1Y	1 Red 480V 50/60 Hz	64
1V	1 Red 600V 50/60 Hz	64
1G	1 Green 120V AC/DC	52
1H	1 Green 240V AC/DC	52
1K	1 Green 480VAC @	64
1L	1 Green 600VAC @	64
2R	2 Red 120V AC/DC	104
2P	2 Red 240V AC/DC	104
2Y	2 Red 480VAC @	128
2V	2 Red 600VAC @	128
2G	2 Green 120V AC/DC	108
2H	2 Green 240V AC/DC	104
2K	2 Green 480VAC @	128
2L	2 Green 600VAC @	128

d		
Station Type		
Rosite/Booted Operator Station		
Code	Description	Price
1R	1 Operator	\$ 60
2R	2 Operator	60
3R	3 Operator	96
5R	5 Operator	113
Rosite/Bootless Operator Station		
Code	Description	Price
1R	1 Operator	\$ 50
2R	2 Operator	60
3R	3 Operator	96
5R	5 Operator	113

e		
Accessory Options		
Code	Description	Price
Blank	No accessory option	\$ -
W	Padlock Attachment - Stop Button	18
G	Mushroom Head on Red Push Button	18
JG	Jumped Mushroom Head on Red Push Button	24

1. Button Type/Color

Station Description		
Station Type	Legend Plate	Button/Color
Standard Surface Mounted	Stop/Emergency Stop	Extended/Red
	Start	Flush/Green
	All Other/No Legend	Flush/Black
Maintained	Emergency Stop	2 Position Push-Pull/Twist-Red

For added corrosion resistance, specify Booted push buttons w/optional Stainless Steel Rings. Change number to Bulletin 800HS and add to the List Price for each booted operator.

Transformers operate at 50/60 Hz.

PARSONS ENGINEERING SCIENCE, INC. PROJECT NO.

733549.10100

CONTRACTOR:

HASELEY CONSTRUCTION COMPANY, INC.

ADDRESS:

10315 LOCKPORT ROAD, NIAGARA FALLS, NY 14304

PROJECT:

NIAGARA COUNTY REFUSE SITE

SUBMITTAL NO:

25

DATE OF SUBMITTAL:

11/17/98

TYPE OF SUBMITTAL (CHECK ONE)



Product Data



Schedule



Performance Data



Sample



Warranty



Operations & Maintenance Data



Color Selection



Test Report



Record Document



DESCRIPTION OF SUBMITTAL:

Product Name:

CONDUIT AND FITTINGS

Manufacturer:

OCAL BLUE

Subcontractor/Supplier:

CIR ELECTRICAL CONSTRUCTION CORP.

Section No.(s):

02601

Drawing No.(s):

P-12

Part/Paragraph:

2.3A

Detail Reference:

ENGINEER'S APPROVAL

SUBMITTAL REVIEWED SOLELY
FOR GENERAL COMPLIANCE
WITH CONTRACT DOCUMENTS

DATE:

11-19-99 *W. L. Bey*

AS NOTED

FABRICATION/INSTALLATION/PRODUCTION

MAY PROCEED

REVISE AND RESUBMIT

REJECTED

FABRICATION/INSTALLATION/PRODUCTION
MAY NOT PROCEED.

PARSONS ENGINEERING SCIENCE

CONTRACTOR'S APPROVAL STAMP

NIAGARA COUNTY REFUSE SITE
HASELEY CONSTRUCTION CO., INC.

Date:

11/17/98

Item:

CONDUIT & FITTINGS

Specification:

ELECTRICAL

Section:

02601 Para. No. 2.3A

Drawing No.:

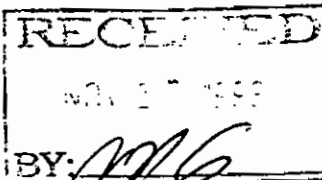
P-12 Page No. 4

Location:

NCS Submittal No. 25

APPROVED BY: WILLIAM L. BEY

RECEIVED STAMPS



Shop Drawing Submittal

**Project: Niagara County Refuse Site
Wheatfield, New York**

**Contractor: The Haseley Companies
10315 Lockport Road
P.O. Box 212 L.P.O.
Niagara Falls, New York 14304**

**Sub-Contractor: CIR Electrical Construction Corp.
1067 Harlem Road
Buffalo, New York 14227**

Engineer: Conestoga-Rovers & Associates

Date: 11/13/98

Spec. Section

Item

16000 - 2.9B Underground (Landfill /Wells) Installation:

Description

Item: PVC Coated Conduit and Fittings

Manufacture: Ocal Blue

OCAL-BLUE Conduit

- The conduit is "Hot Dipped" galvanized after fabrication
- Threads are hot dipped galvanized
- Blue urethane coating over threads
- A minimum .040" (40 mil) PVC coating on the exterior
- A nominal .002" (2 mil) blue urethane on the interior
- Color coded thread protectors
- Couplings shipped with conduit are packaged separately



OCAL-BLUE CONDUIT

Size Inches Metric Size Designator*	Outside Diameter Steel Only Inches Millimeters	Outside Diameter With PVC Inches Millimeters	Nominal Wall Thickness Steel Only Inches Millimeters	Nominal Wall Thickness With PVC Inches Millimeters	Nominal Inside Diameter Inches Millimeters	Cross Section Area In Square Inches Millimeters	Length Without Couplings Feet Meters	Minimum Weight Per Foot Pounds Kilograms
1/2 16	.840 21.3	.920 23.3	.104 2.64	.144 3.556	.632 16.1	.304 7.72	9' 11 1/4" 3.03	.79 35.83
3/4 21	1.050 26.7	1.130 28.7	.107 2.71	2.71 3.73	.836 21.2	.533 13.53	9' 11 1/4" 3.03	1.05 47.63
1 27	1.315 33.4	1.395 35.4	.126 3.20	.166 4.21	1.063 27.0	.864 21.94	9' 11" 3.02	1.53 69.40
1 1/4 35	1.660 42.2	1.740 44.1	.133 3.37	.173 4.39	1.394 35.4	1.495 37.97	9' 11" 3.02	2.01 91.17
1 1/2 41	1.900 48.3	1.980 50.2	.138 3.50	.178 4.52	1.624 41.2	2.036 51.71	9' 11" 3.02	2.40 112.95
2 53	2.375 60.3	2.455 62.3	.146 3.70	.186 4.72	2.083 52.9	3.355 85.21	9' 11" 3.02	3.32 150.60
2 1/2 63	2.875 73.0	2.955 75.0	.193 4.90	.233 5.91	2.489 63.2	4.788 121.61	9' 10 1/2" 3.01	5.27 239.05
3 78	3.500 88.9	3.580 90.9	.205 5.20	.245 6.22	3.090 78.5	7.393 187.78	9' 10 1/2" 3.01	6.83 309.63
3 1/2 91	4.000 101.6	4.080 103.6	.215 5.46	.255 6.47	3.57 90.7	9.866 250.59	9' 10 1/4" 3.00	8.31 376.94
4 103	4.500 114.3	4.580 116.3	.225 5.71	.265 6.73	4.05 102.9	12.730 323.34	9' 10 1/4" 3.00	9.73 441.04
5 129	5.563 141.3	5.643 143.3	.245 6.22	.285 7.23	5.073 128.9	20.006 508.15	9' 10" 3.00	13.14 595.85
6 155	6.625 168.3	6.705 170.3	.266 6.75	.306 7.77	6.093 154.8	28.891 733.83	9' 10" 3.00	17.46 791.67

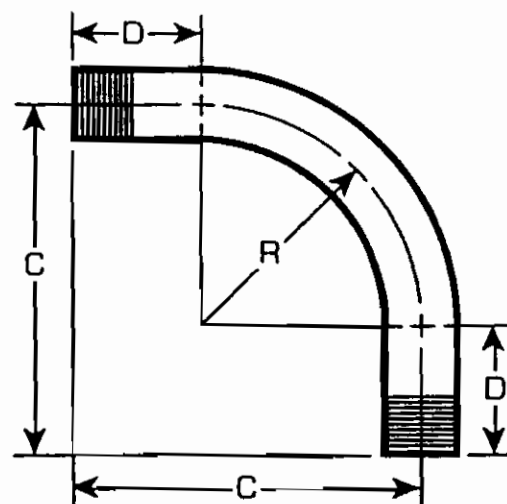
NOTE - Inches and Pounds indicated in bold face type
Metric measure is directly below bold face type
* Metric size designator (ANSI C80.1-1994).

OCAL-BLUE Elbows

OCAL-BLUE Standard and Large Radius Elbows

OCAL-BLUE standard and large radius elbows are factory bent to reduce the time and wasted materials that can result from field bending.

- OCAL-BLUE elbows are fabricated from OCAL coated conduit
- Standard radiuses in 30°, 45°, 60° and 90° are available for immediate shipment
- Special radiuses and degrees not listed are also available upon request
- Color coded thread protectors



STANDARD RADIUS ELBOWS

Size		Radius "R"		Offset "C"		Straight End "D"		Unbent Length		Weight Per Each	
Inches	Metric Size Designator*	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Pounds	Kilograms
1/2	16	4.00	101.6	6.50	165.1	2.12	53.848	11.25	285.75	0.73	.331
3/4	21	4.50	114.3	7.25	184.15	2.75	69.85	12.50	317.5	1.07	.485
1	27	5.75	146.05	8.63	219.202	2.88	73.152	14.75	374.65	1.93	.875
1 1/4	35	7.25	184.15	10.44	265.176	3.19	81.026	17.75	450.85	2.85	1.293
1 1/2	41	8.25	209.55	11.63	295.402	3.38	84.785	19.75	501.65	4.26	1.932
2	53	9.50	241.3	13.31	338.074	3.81	96.774	22.50	571.5	6.50	2.948
2 1/2	63	10.50	266.7	16.50	419.1	5.75	146.05	28.00	711.2	11.50	5.216
3	78	13.00	330.2	18.75	476.25	5.79	147.066	32.00	812.8	18.00	8.165
3 1/2	91	15.00	381.0	22.96	583.184	7.96	202.184	39.50	1003.3	26.25	11.907
4	103	16.00	406.4	23.18	588.772	7.96	202.184	39.50	1003.3	32.00	14.5
5	129	24.00	609.6	34.90	835.66	10.90	276.86	59.50	1511.3	70.00	31.752
6	155	30.00	762.0	43.44	1103.376	14.40	365.76	76.00	1930.4	100.00	45.36

LARGE RADIUS ELBOWS

Size		Radius "R"		Offset "C"		Straight End "D"		Unbent Length	
Inches	Metric Size Designator*	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters
1 - 2 1/2" incl.	27 - 63	12	304.8	1' 9"	533.4	9"	228.6	3' 0"	914.4
1 - 3" incl.	27 - 78	15	381.0	2' 0"	609.6	9"	228.6	3' 6"	1066.8
1 - 4" incl.	27 - 103	18	457.2	2' 4"	711.2	10"	254.0	4' 0"	1219.2
1 - 5" incl.	27 - 129	24	609.6	2' 11"	889.0	11"	279.4	4' 11"	1498.6
1 - 6" incl.	27 - 155	30	762.0	3' 5"	1041.4	11"	279.4	5' 9"	1752.6
1 - 6" incl.	27 - 155	36	914.4	3' 11"	1193.8	11"	279.4	6' 6"	1981.2
1 - 6" incl.	27 - 155	42	1066.8	4' 6"	1371.6	12"	304.8	7' 6"	2286.0
1 - 6" incl.	27 - 155	48	1219.2	5' 0"	1524.0	12"	304.8	8' 6"	2590.8
2 1/2 - 6" incl.	63 - 155	60	1524.0	6' 0"	1828.8	12"	304.8	9' 10"	2997.2

* Metric size designator (ANSI C80.1-1994).

GUA Series Conduit Outlet Bodies



GUA series conduit outlet bodies are installed within hazardous area locations to: protect conductors in threaded rigid conduit, act as pull and splice boxes, provide access to conductors for maintenance and future system changes, act as mounting outlets for fixtures (with proper covers), or change conduit direction.

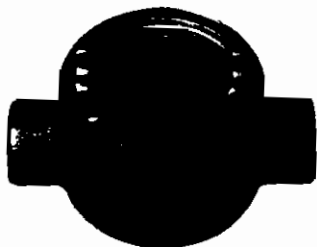
- Double coated with a nominal .002" (2 mil) blue urethane on both the interior and exterior, before PVC coating is applied
- A minimum .040 (40 mil) PVC coating is bonded to the exterior
- All covers are WDD type **feraloy iron covers, not aluminum, to avoid reaction between dissimilar metals**
- OCAL pressure-sealing sleeves on all threaded hubs.

CONDUIT BODIES

Conduit Size		Cover Opening	Type					
Inches	Metric Size Designator*		GUA	GUAC	GUAT	GUAX	GUAB	WDD Cover Only**
1/2	16	2	GUA14	GUAC14	GUAT14	GUAX14	GUAB14	GUAQ4
3/4	21	2	GUA24	GUAC24	GUAT24	GUAX24	GUAB24	GUAQ4
1/2	16	3	GUA16	GUAC16	GUAT16	GUAX16	GUAB16	GUAQ6
3/4	21	3	GUA26	GUAC26	GUAT26	GUAX26	GUAB26	GUAQ6
1	27	3	GUA36	GUAC36	GUAT36	GUAX36	GUAB36	GUAQ6
1	27	3 5/8	-	-	GUAT37	GUAX37	-	GUAQ7
1 1/4	35	3 5/8	GUA47	GUAC47	GUAT47	GUAX47	GUAB47	GUAQ7
1 1/4	35	5	-	GUAC49	GUAT49	GUAX49	-	GUAQ9
1 1/2	41	5	GUA59	GUAC59	GUAT59	GUAX59	GUAB59	GUAQ9
2	53	5	-	GUAC69	GUAT69	GUAX69	GUAB69	GUAQ9

* Metric size designator (ANSI C80.1-1994).

** WDD type feraloy covers are provided as standard by OCAL on all GUA series conduit bodies.



GUAC



GUAT



GUAX

(Fittings shown uncoated)



GUAB



GUAD



GUAL

(Fittings shown uncoated)

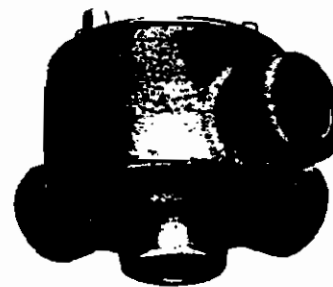
CONDUIT BODIES

Conduit Size		Cover Opening	Type					
Inches	Metric Size Designator*		GUAD	GUAL	GUAM	GUAN	GUAW	WOD Cover Only**
1/2	16	2	GUAD14	GUAL14	GUAM14	GUAN14	GUAW14	GUAO4
3/4	21	2	GUAD24	GUAL24	GUAM24	GUAN24	GUAW24	GUAO4
1/2	16	3	GUAD16	GUAL16	GUAM16	GUAN16	GUAW16	GUAO6
3/4	21	3	GUAD26	GUAL26	GUAM26	GUAN26	GUAW26	GUAO6
1	27	3	GUAD36	GUAL36	GUAM36	GUAN36	-	GUAO6
1 1/4	35	3 3/8	-	GUAL47	GUAM47	GUAN47	-	GUAO7
1 1/4	35	5	GUAD49	GUAL49	-	-	-	GUAO9
1 1/2	41	5	-	GUAL59	-	GUAN59	-	GUAO9
2	53	5	-	GUAL69	GUAM69	GUAN60	-	GUAO9

* Metric size designator (ANSI C80.1-1994). ** WOD type ferrel covers are provided as standard by OCAL on all GUA series conduit bodies.



GUAN



GUAW

(Fittings shown uncoated)

PARSONS ENGINEERING SCIENCE, INC. PROJECT NO.

733549.10100

CONTRACTOR:

HASELEY CONSTRUCTION COMPANY, INC.

ADDRESS:

10315 LOCKPORT ROAD, NIAGARA FALLS, NY 14304

PROJECT:

NIAGARA COUNTY REFUSE SITE

SUBMITTAL NO:

49

DATE OF SUBMITTAL:

11/17/98

TYPE OF SUBMITTAL (CHECK ONE)



Product Data



Schedule



Performance Data



Sample



Warranty



Operations & Maintenance Data



Color Selection



Test Report



Record Document



DESCRIPTION OF SUBMITTAL:

Product Name:

JUNCTION BOXES, PULL BOXES

Manufacturer:

CROUSE-HINDS

Subcontractor/Supplier:

CIR ELECTRICAL CONSTRUCTION CORP.

Section No.(s):

16000

Drawing No.(s):

P-12

Part/Paragraph:

2.11A

Detail Reference:

ENGINEER'S APPROVAL

CONTRACTOR'S APPROVAL STAMP

SUBMITTAL REVIEWED SOLELY
FOR GENERAL COMPLIANCE
WITH CONTRACT DOCUMENTS

DATE/BY

11-18-99

REVIEWED

REVIEWED AS NOTED

FABRICATION/INSTALLATION/PRODUCTION
MAY PROCEED.

REVISE AND RESUBMIT

REJECTED

FABRICATION/INSTALLATION/PRODUCTION
MAY NOT PROCEED.

PARSONS ENGINEERING SCIENCE

NIAGARA COUNTY REFUSE SITE
HASELEY CONSTRUCTION CO., INC.

Date: 11/17/98

Item: Junction & Pull Boxes

Specification: ELECTRICAL

Section: 16000 Para. No. 2.11A

Drawing No.: Page No. 9

Location: NCCS Submittal No. 49

APPROVED BY: WILLIAM L. BEY WLB

RECEIVED STAMPS

RECEIVED
NOV 17 1998
BY: M/B

Shop Drawing Submittal

Project: Niagara County Refuse Site
Wheatfield, New York

Contractor: The Haseley Companies
10315 Lockport Road
P.O. Box 212 L.P.O.
Niagara Falls, New York 14304

Sub-Contractor: CIR Electrical Construction Corp.
1067 Harlem Road
Buffalo, New York 14227

Engineer: Conestoga-Rovers & Associates

Date: 11/13/98

<u>Spec. Section</u>	<u>Item</u>

Drawing E7	Pull & Junction Boxes

	<u>Description</u>

	Item: Pull Boxes

	Manufacture: Crouse-Hinds

	Catalog #: EKC60

Conduit[®] Pull Boxes and Outlet Bodies

Cl. I, Div. 1 & 2, Groups E, F, G
Cl. II, Div. 1, Groups E, F, G
Cl. II, Div. 2, Groups F, G
Cl. III
NEMA 7CD, 9EFG

Explosionproof
Dust-Ignitionproof

4F-5



Application:

ESC series pull boxes are installed in conduit systems within hazardous areas to:

- protect conductors in threaded rigid conduit
- act as pull and splice fittings
- interconnect lengths of conduit
- provide access for maintenance and future system changes

EKC series conduit outlet bodies are installed in conduit systems within hazardous areas to:

- provide convenient opening in conduit system for pulling or splicing conductors

Features:

ESC pull boxes have:

- taper threaded hubs for ground continuity
- cylindrical shape that permits closest conduit spacing
- smooth integral hub bushings to protect conductor insulation when pulling
- snap ring lock on threaded cover permits moving cover along conduit in either direction by disengaging snap ring and unthreading cover in desired direction
- snap ring registration requirement leads to proper cover threading and resultant flamtight joint

EKC bodies have:

- accurately machined body and cover mating surfaces to insure flamtight joint when properly assembled
- extra long cover opening to facilitate pulling and splicing of conductors
- taper threaded hubs and integral bushing for rigid threaded conduit

Standard Materials:

- ESC – *Feraloy*[®] iron alloy
- EKC bodies – *Feraloy* iron alloy

Standard Finishes:

- *Feraloy* – electrogalvanized and aluminum acrylic paint

Options:

- EKC series:
Corro-free[™] epoxy powder coat – information available on request

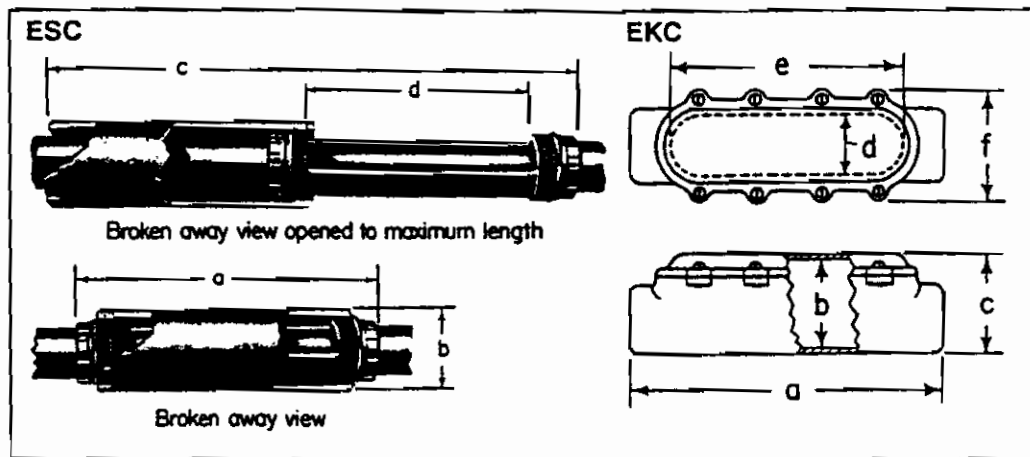
Size Ranges:

- ESC – hub size – 1/2" to 4"
- EKC bodies – hub size – 1" to 3"

Certifications and Compliances:

- NEC:
ESC –
Class I, Division 1 & 2, Groups C, D
Class II, Division 1, Groups E, F, G
Class II, Division 2, Groups F, G
Class III
EKC 30 – 60
Class I, Division 1 & 2, Groups C, D
Class II, Division 1, Groups E, F, G
Class II, Division 2, Groups F, G
Class III
EKC 70, 80
Class I, Division 1 & 2, Groups C, D
Class II, Division 1, Groups E, F, G
Class II, Division 2, Groups F, G
Class III
- UL Standard: 886
- CSA Standard: C22.2 No. 30

Dimensions

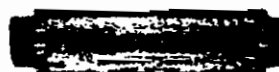


ESC

Size	a	b	c	d	Diameter of work opening
1/2 – 3/4	10	2 3/4	16	6	1 1/8
1 – 1 1/4	14	3 3/4	23 3/4	10	1 3/8
1 1/2 – 2	21 1/2	4 1 1/4	37 1/2	16	2 1/4
2 1/2 – 3	29 1/2	5 1/2	53 1/4	24	3 3/8
3 1/2 – 4	45 1/2	7 1/2	82 1/2	38	5 1/4

EKC

Size	a	b	c	d	e	f
1 – 1 1/4	12 1/2	3 3/4	3 3/4	1 1/2	9	4
1 1/2 – 2	15 1/4	3 1/2	4 1/4	2 1/2	12	5
2 1/2 – 3	21 1/2	5 1/2	6	3 1/2	16	6 1/4



ESC



EKC

ESC Pull Boxes

Hub Size	Cat. #
1/2	ESC1
3/4	ESC2
1	ESC3
1 1/4	ESC4
1 1/2	ESC5
2	ESC6
2 1/2	ESC7
3	ESC8
3 1/2	ESC9
4	ESC10

EKC Outlet Bodies

Hub Size	Cat. #
1	EKC30
1 1/4	EKC40
1 1/2	EKC50
2	EKC60
2 1/2	EKC70
3	EKC80

Shop Drawing Submittal

Project: Niagara County Refuse Site
Wheatfield, New York

Contractor: The Haseley Companies
10315 Lockport Road
P.O. Box 212 L.P.O.
Niagara Falls, New York 14304

Sub-Contractor: CIR Electrical Construction Corp.
1067 Harlem Road
Buffalo, New York 14227

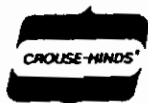
Engineer: Conestoga-Rovers & Associates

Date: 11/13/98

<u>Spec. Section</u>	<u>Item</u>
Drawing E7	Pull & Junction Boxes

Description

Item: Junction Boxes
Manufacture: Crouse-Hinds
Catalog: #GUB03MP-108-G0B0
 #GUB03MP-110-0G0B00AAA000
 #GUB03MP-109-000ABGA0
 #GUB03MP-110-000000AAA0G0



Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 4,7BCD,9EFG

Dust-Ignitionproof
Raintight
Wet Locations
Watertight

06F Junction Boxes

Application:

GUE, GUB series junction boxes are used in threaded rigid conduit systems in hazardous areas:

- to function as a splice box, pull box or equipment and device enclosure
- indoors and outdoors

Features:

- Threaded construction throughout permits use in hazardous areas.
- Bodies have thick walls so they can be factory or field drilled and tapped to meet NEC/CEC requirements for Class I hazardous areas.
- Covers are provided with a neoprene "O" ring gasket to meet NEMA/EEMAC 4 requirements for a watertight seal*
- Internal grounding lug provides a means to ground enclosed equipment.
- Boxes are machined for field installed mounting plates.

Standard Materials:

- Bodies - *Feraloy*[®] iron alloy
- Covers - copper-free aluminum

Standard Finishes:

- *Feraloy* iron alloy - GUB01, GUB02 - electrogalvanized and aluminum acrylic paint. All other boxes - zinc chromate primer and aluminum acrylic paint
- Copper-free aluminum - natural

Options:

Description	Suffix to be Added to Cat. #
Material -	
<i>Feraloy</i> iron alloy covers	WOD
For GUB01, GUB02, GUB03 and GUB06 to be furnished in copper-free aluminum	SA
Mounting plate for relays, terminal blocks, electrical devices, etc.	MP
Factory installed terminal blocks	Information on request

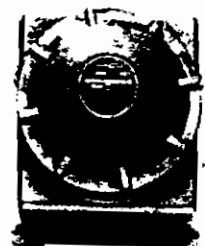
Certifications and Complies:

- NEC/CEC:
Class I, Division 1 & 2, Groups B,C,D
Class II, Division 1, Groups E,F,G
Class II, Division 2, Groups F,G
Class III
- UL Standard: 886
- CSA Standard: C22.2 No. 30

Junction Boxes Without Hubs** (use as first segment of Cat. No. for ordering)



GUE:
5 1/4" x 5 1/4" x 5 1/4"
3 1/2" cover opening



GUB01:
6 1/4" x 7" x 5 1/4"
5 1/2" cover opening

GUB02:
8" x 10" x 5 1/4"
7" cover opening

GUB06: 8 1/2" x 10" x 6 1/4"
7" cover opening



GUB03:
11" x 12" x 8 1/4"
9 1/2" cover opening

GUB01110:
14" x 18" x 13 1/2"
12 1/2" cover opening

GUB15151: 19" x 21" x 16 1/4"
16 1/2" cover opening



GUB04:
11" x 12" x 8 1/4"
9 1/2" cover opening

GUB08:
8 1/2" x 10" x 6 1/4"
7" cover opening

Ordering Information:

Junction boxes listed can be furnished with drilled and tapped conduit openings, subject to the limitations of maximum opening, number and spacing shown in Tables 1, 2 and 4.

To Order:

Step 1

Select the box required from photos at left and dimensional drawings on page 6F-12

Step 2

Select standard conduit arrangement from Table 1.

Step 3

Determine maximum size conduit opening required from Table 2 (consider conduit opening spacing from Table 4).

Step 4

Select appropriate symbol for required drilled and tapped holes from Table 3.

Example:

Step 1 - box required GUB06
Step 2 - arrangement 108
Step 3 - openings - 1 1/2" at "a" and "c"; 1" at "b" and "d".
Step 4 - symbols are substituted and written in clockwise order starting with location "a". For this example: FCFC Complete Cat. No. is made up of three parts: Part 1 - box number; Part 2 - arrangement number; Part 3 - symbols for conduit openings. For this example: GUB06-108-FCFC. When no opening is required at a particular location, use symbol "0" (zero).

If none of the standard arrangements meet requirements, send a sketch showing junction box number with size and location of each opening desired.

† Tables 1, 2, 3, 4 and 5 appear on pages 6F-11, 12 and 13.

* Not available on GUB01110 and GUB15151.

** External dimensions provided.

NOTE: For conduit liner ordering information, see page 6F-29.

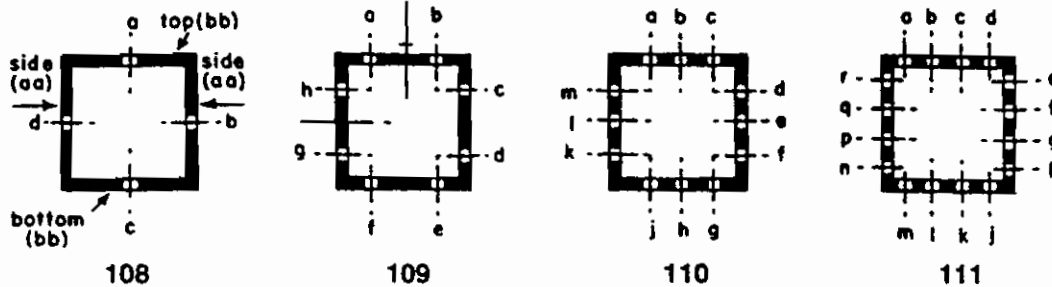
GUE, GUB Junction Boxes

Cl. I, Div. 1 & 2, Groups D, E, F
Cl. II, Div. 1, Groups E, F, G
Cl. II, Div. 2, Groups F, G
Cl. III
NEMA 4, 7BCD, 9EFG

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations
Watertight



Table 1/Arrangements of Drilled and Tapped Conduit Openings –
For other arrangements, send sketch and complete description



Conduit opening arrangements shown in the illustration should meet the majority of requirements. These GUB junction boxes will be supplied with drilled and tapped openings up to the maximum size and number shown in Table 2.

06F Junction Boxes

Table 2/Maximum Size & No. of Drilled & Tapped Holes

First Division of Cat. #	Top & Bottom (bb) †				Each Side (aa) †				Back ‡			
	1	2	3	4	1	2	3	4	1	2	3	4
Group D*												
GUE	2	1			2	1			2	1	¾	¾
GUB01	2	1½	¾		2	1½	1	½	¾	¾	¾	¾
GUB02	2	2	1	¾	2	2	1½	1	¾	¾	¾	¾
GUB06	2	2	1	¾	2	2	1½	1	2	2	2	2
GUB08	2	2	1	¾	2	2	1½	1	2	2	2	2
GUB03	2	2	1½	1	2	2	2	1½	4	4	3½	3
GUB04	2	2	1½	1	2	2	2	1½	4	4	3½	3
GUB01110	2	2	2	1½	2	2	2	2	6	6	4	3½
GUB15151	5	4	3½	2½	5	4	4	3	6	6	6	6
Group C ♦												
GUE	2	1			2	1			2	1	¾	¾
GUB01	2	1½	¾		2	1½	¾		¾	¾	¾	¾
GUB02	2	1½	¾		2	2	1½	¾	¾	¾	¾	¾
GUB06	2	1½	¾		2	2	1½	¾	2	2	2	1½
GUB08	2	1½	¾		2	2	1½	¾	2	2	2	1½
GUB03	2	2	1½	¾	2	2	1½	1	4	3½	2½	2½
GUB04	2	2	1½	¾	2	2	1½	1	4	3½	2½	2½
GUB01110	2	2	2	1½	2	2	2	2	6	6	4	3½
GUB15151	5	4	3	2	5	4	3½	2½	6	6	6	5
Group B ♦ ♦												
GUE	2	1			2	1			2	1	¾	¾
GUB01	2	1½	¾		2	1½	¾		¾	¾	¾	¾
GUB02	2	1½	¾		2	2	1½	¾	¾	¾	¾	¾
GUB06	2	1½	¾		2	2	1½	¾	2	2	2	1½
GUB08	2	1½	¾		2	2	1½	¾	2	2	2	1½
GUB03	2	2	1½	¾	2	2	1½	1	4	3½	2½	2½
GUB04	2	2	1½	¾	2	2	1½	1	4	3½	2½	2½
GUB01110	2	2	2	1½	2	2	2	2	4	4	4	4
GUB15151	4	4	3½	2½	4	4	3½	2½	4	4	4	4

Table 3/Drilled & Tapped Holes

Size	Symbol
¾	A
¾	B
1	C
1½	E
1½	F
2	G
2½	H
3	J
3½	K
4	L
none	0

* Group D chart is based on use of staggered unions. If adjacent unions are desired, additional spacing may be necessary.

† Sidewall and top and bottom sizes are based on all openings being in line.

‡ Backwall sizes are based on: two per side – diagonal corners; four per side – one in each corner; three per side – triangular pattern with two on adjacent corners on long wall and third in center of opposite long wall.

♦ Conduit seals are required within 1½" of all conduit entrances for Class I, Group C hazardous locations.

♦ ♦ Conduit seals are required within 1½" of all conduit entrances for Class I, Group B hazardous locations.

NOTE: For conduit liner ordering information, see page 6F-29.

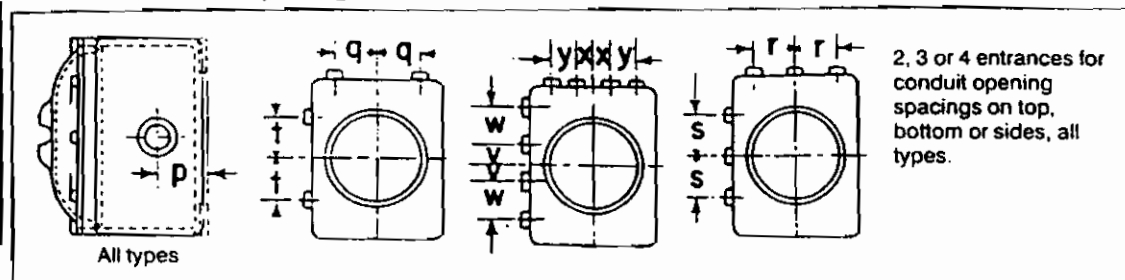


Dimensions

Cl. II, Div. 1, Groups E, F, G
Cl. II, Div. 2, Groups F, G
Cl. III
NEMA 4, 7BCD, 9EFG

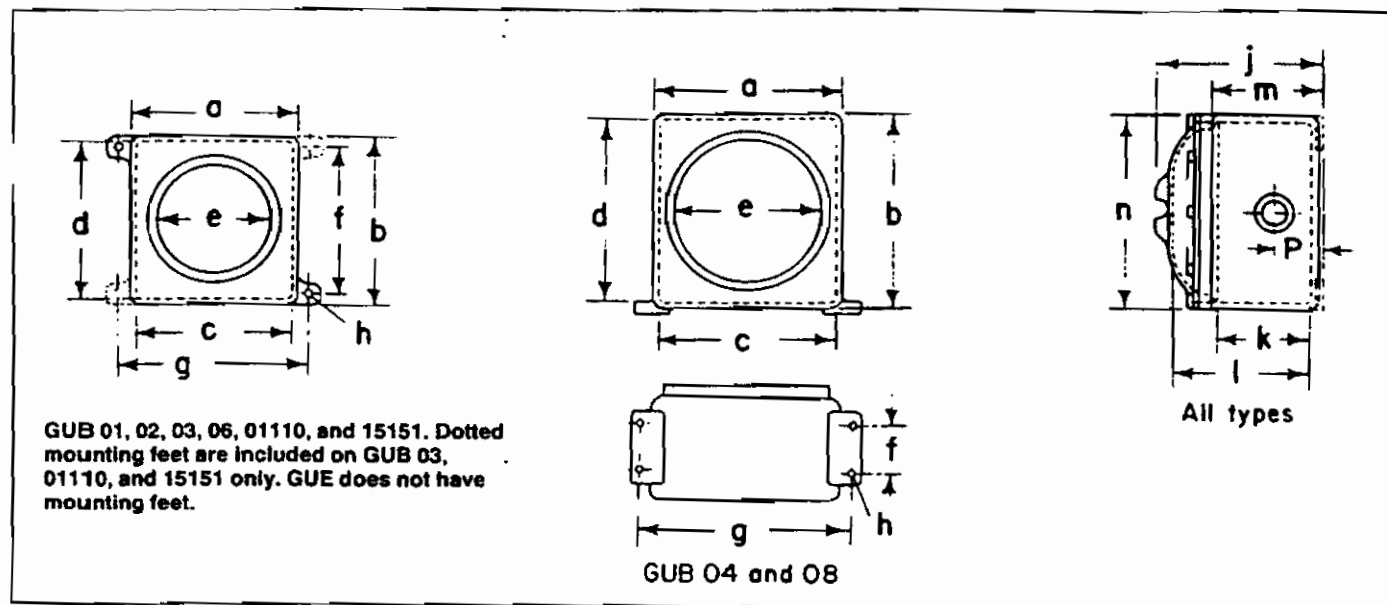
Dust-tight/nonproof
Raintight
Wet Locations
Watertight

Table 4/Conduit Spacings



Type	p	q	r	s	t	v	w	x	y
GUE	1 1/8	1 1/8	—	—	1 1/8	—	—	—	—
GUB01	2 1/16	1 1/8	2 1/8	2 1/8	1 1/8	7/8	1 1/8	25/32	1 1/16
GUB02	2 1/16	1 7/32	2 1/8	2 1/8	1 7/32	1 1/32	2 1/16	3/8	1 3/8
GUB06	2 1/16	1 7/32	2 1/8	2 1/8	1 7/32	1 1/32	2 1/16	3/8	1 3/8
GUB08	2 1/16	1 7/32	2 1/8	2 1/8	1 7/32	1 1/32	2 1/16	3/8	1 3/8
GUB03	3	2 1/8	3 1/8	3 1/8	3	1 3/32	2 1/16	1 1/32	2 1/16
GUB04	3	1 7/32	3 1/8	3 1/8	3	1 3/32	2 1/16	1 1/32	2 1/16
GUB01110	4 3/4	3	4	6	4	2	4	1 7/32	3 1/16
GUB15151	6	4	5 1/8	5 1/8	4	2	4	2	4

Dimensions



Type	a	b	c†	d†	e	f	g	h	i	k†	l†	m	n
GUE	5 1/8	5 1/8	4 3/8	4 3/8	3	—	—	—	5 3/8	2 1/8	3 3/8	3 1/2	4 1/8
GUB01	6 1/8	7	5 1/8	5 1/8	5 1/8	5 1/8	7 1/8	1 1/32	5 3/8	3 3/8	4 1/8	4 1/8	6 1/8
GUB02	8	10	7 1/8	9 1/8	7	8 1/8	9	1 1/32	5 3/8	3	4 1/8	4 1/8	7 1/8
GUB06	8 1/8	10	7 1/8	8 1/8	7	8 1/8	9 1/8	3/16	7 1/8	4 1/8	5 1/8	5 1/8	7 1/8
GUB08	8 1/8	10	7 1/8	8 1/8	7	2 1/8	9 1/8	3/16	7 1/8	4 1/8	5 1/8	5 1/8	7 1/8
GUB03	11	12	9 1/8	10 1/8	9 1/8	10 1/8	12 1/8	3/16	8 1/8	5	7 1/8	6 1/8	11
GUB04	11	12	9 1/8	10 1/8	9 1/8	3 1/8	12 1/8	3/16	8 1/8	5	7 1/8	6 1/8	11
GUB01110	14 1/8	18 1/8	13	17	12 1/8	16	16	1	13 1/8	6 1/8	10 1/8	9 1/8	14
GUB15151	20 1/8	18 1/8	19 1/8	17 1/8	16 1/8	18	21	1	16 1/8	9	13 1/8	11 1/8	18

† Inside Dimensions

NOTE: For conduit liner ordering information, see page 6F-29.

GUE, GUB Junction Boxes

Mounting Plate Dimensions

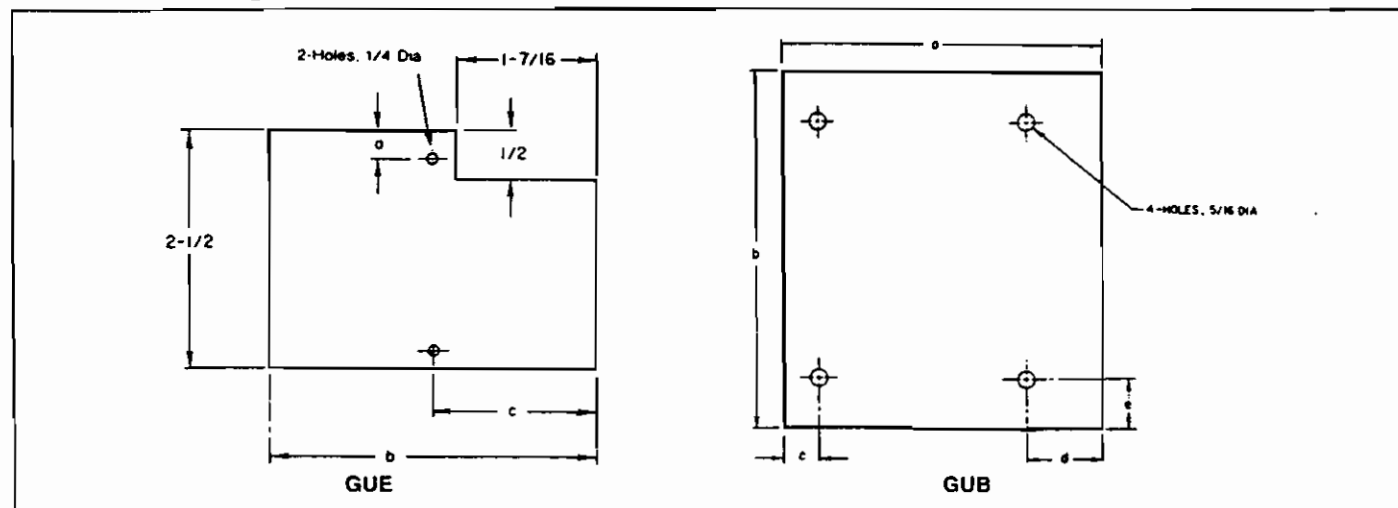
Cl. I, Div. 1 & 2, Groups B,C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 4,7BCD,9EFG

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations
Watertight

6F-13



Table 5/Mounting Plate Dimensions



Cat. #	Mounting Plate Kit Cat. #	a	b	c	d	e
GUE	GUE-MP	1/2	3 3/4	1 13/16	—	—
GUB01	GUB-MP01	4 3/4	5	3/8	1	1
GUB02	GUB-MP02	5 1/4	6 1/4	3/8	1 1/8	1 1/4
GUB03	GUB-MP03	8	9	1 3/8	1 1/8	1 1/2
GUB04	GUB-MP03	8	9	1 3/8	1 1/8	1 1/2
GUB06	GUB-MP02	5 3/4	6 1/4	3/8	1 13/16	1 1/4
GUB08	GUB-MP02	5 3/8	6 1/4	3/8	1 1/8	1 1/4
GUB01110	GUB-MP01110	8 3/4	12	1 3/8	1 1/8	1 1/2
GUB15151	GUB-MP15151	14	14	1 1/2	1 1/2	1 1/2

NOTE: For conduit liner ordering information, see page 6F-29.

6F Junction Boxes

SUBMITTAL COVER

PARSONS ENGINEERING SCIENCE, INC. PROJECT NO.

733549.10100

CONTRACTOR:

HASELEY CONSTRUCTION COMPANY, INC.

ADDRESS:

10315 LOCKPORT ROAD, NIAGARA FALLS, NY 14304

PROJECT:

NIAGARA COUNTY REFUSE SITE

SUBMITTAL NO:

49A

DATE OF SUBMITTAL:

01/28/99

TYPE OF SUBMITTAL (CHECK ONE)



Product Data



Schedule



Performance Data



Sample



Warranty



Operations & Maintenance Data



Color Selection



Test Report



Record Document



SHOP DRAWINGS

DESCRIPTION OF SUBMITTAL:

Product Name:

GROUND ROD INSPECTION UNITS

Manufacturer:

KISTNER CONCRETE PRODUCTS

Subcontractor/Supplier:

CIR ELECTRICAL CONSTRUCTION CORP.

Section No.(s):

16000

Drawing No.(s):

E-5

Part/Paragraph:

2.12

Detail Reference:

A

ENGINEER'S APPROVAL

CONTRACTOR'S APPROVAL STAMP

2-2-99 100

NIAGARA COUNTY REFUSE SITE
HASELEY CONSTRUCTION CO., INC.

Date: 1/28/99

Item: GROUND ROD INSPECTION

Specification: ELECTRICAL

Section: 16000 Para. No. 2.12

Drawing No.: E-5 Page No. 9

Location: NCPS Submittal No. 49A
APPROVED BY: WILLIAM L. BEY

RECEIVED STAMPS

RECEIVED
JAN 28 1999
BY: K. Downer



COMMERCIAL • INDUSTRIAL • INSTITUTIONAL • INSTALLATIONS
SERVING BUFFALO AND NIAGARA FALLS

Shop Drawing Submittal

Project: Niagara County Refuse Site
Wheatfield, New York

Contractor: The Haseley Companies
10315 Lockport Road
P.O. Box 212 L.P.O.
Niagara Falls, New York 14304

Sub-Contractor: CIR Electrical Construction Corp.
1067 Harlem Road
Buffalo, New York 14227

Engineer: Conestoga-Rovers & Associates

Date: 01/22/99

<u>Spec. Section</u>	<u>Item</u>

Drawing E5	~~GROUND ROD INSPECTION UNITS~~

Description

Item: PULLBOX & COVER
Manufacturer: KISTNER CONCRETE PRODUCTS, INC.
Catalog: #PB-15-S
#PB-CV9590



ELECTRICAL
INSTRUCTION CORP.

67 HARLEM ROAD
NEW YORK 10014
322-1416
16-327-0821

FAXED
DATE: _____
FAX TRANSMISSION NO.: _____

Purchase Order 186

Job Number: GJ12818C

Order To: Kistner Concrete

Ship To:

~~Hold for Release~~

RELEASE FOR
SHIPMENT

<u>P.O. Number & Date</u>	<u>Buyer</u>	<u>Vendor</u>	<u>Terms</u>	<u>Ship Via</u>	<u>Unit</u>	<u>Price</u>	<u>Ext Cost</u>
186 1/14/99	GJ	KISCON		Best Way			
<u>Item Number</u>	<u>Description</u>	<u>Required</u>	<u>Qty</u>				

PB-15-S 15" x 20" L
DIA

6 each

PB-CV9590

Please fax cost.

9 sets of submittals required as
soon as possible

Hold for release upon approval.

Thank you.



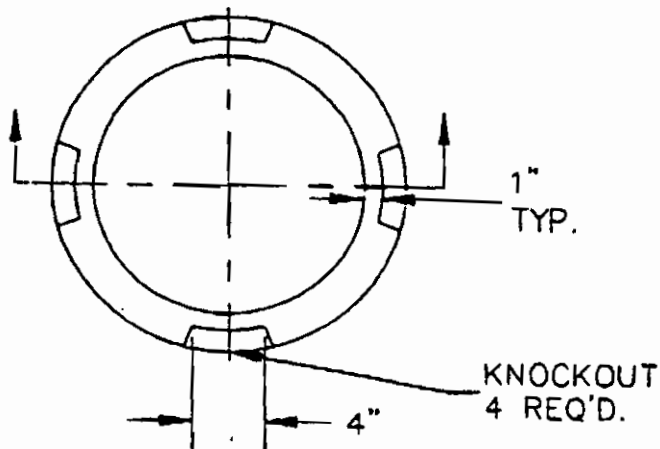
KISTNER CONCRETE
PRODUCTS INC.
8713 READ ROAD
E. PEMBROKE, N.Y.
14056
(716) 894-2267

PRODUCT DESIGNATION

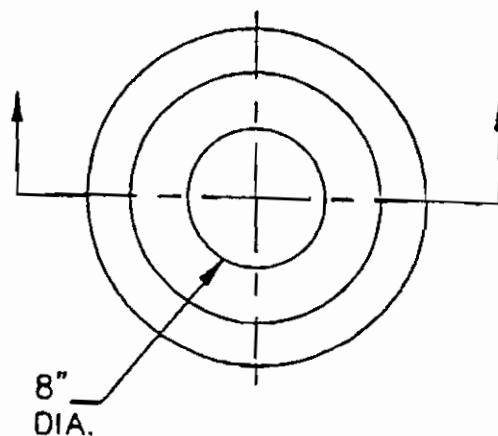
15" DIA. X 20" PULL BOX

DWG. NO.

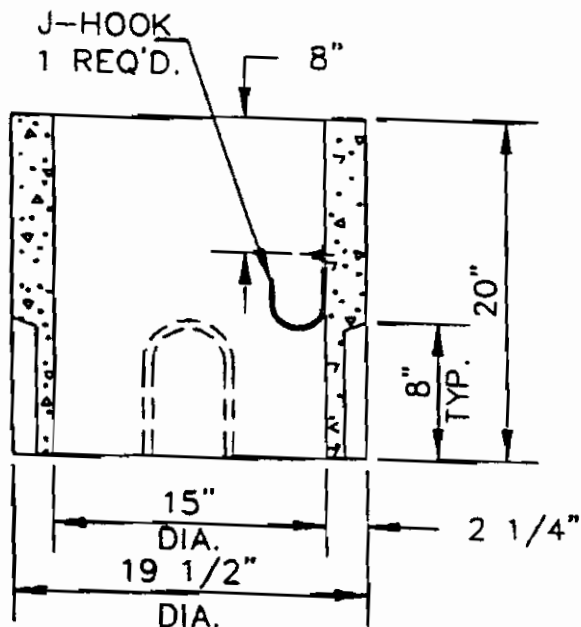
PB-15-S



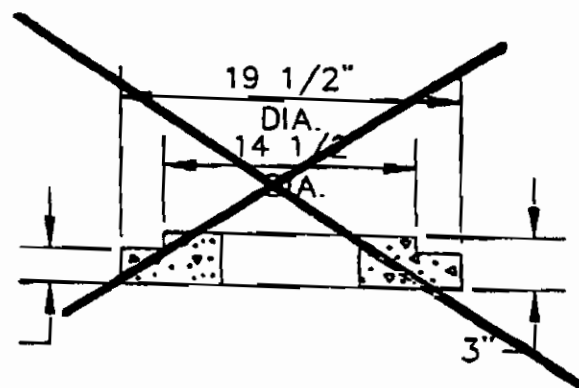
TOP VIEW



TOP VIEW



SECTION



SECTION
CIRCULAR PULL BOX BASE

SPECIFICATIONS:

CONCRETE: 4000 P.S.I. @ 28 DAYS.
ENTRAINED AIR: 5% - 9%.
STEEL: A.S.T.M. A496-A615
GRADE 60-60 KSI.
DESIGN LOADING: A.A.S.H.T.O. HS-20-44
WITH 30% IMPACT AND
EQUIVALENT SOIL PRESSURE
OF 130 (PSF). FLOATION
FORCES NOT ACCOUNTED FOR.

CIRCULAR REINFORCING 0.12 IN. 2/FT.
VERTICAL REINFORCING 0.058 IN. 2/FT.
ONE WIRE HANGER REQ'D.

FOUR KNOCKOUTS
INTERNAL VOLUME: 2.05 CU. FT.
WEIGHT: PULL BOX: 209 LBS.
PULL BOX BASE: 57 LBS.
TOTAL: 266 LBS.

6 REQ'D

N.Y.S.D.O.T. ITEM NO.
680.510101



KISTNER CONCRETE
PRODUCTS INC.
8713 READ ROAD
E. PEMBROKE, N.Y.
14056
(716) 894-2267

PRODUCT DESIGNATION

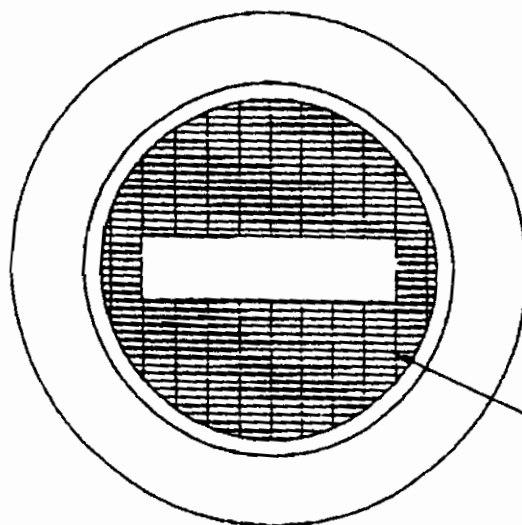
COVER PATTERN NO. 9590

DWG. NO.

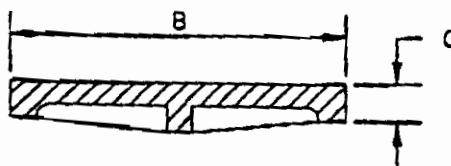
PB-CV9590

©

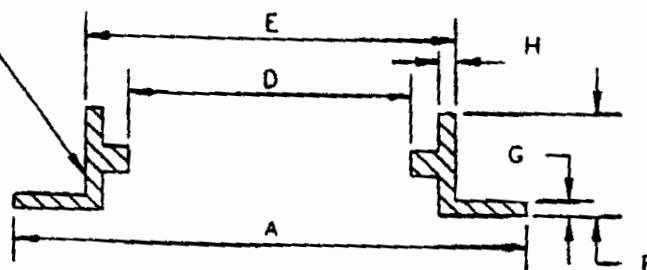
6 REQ'D



NON-SKID TEXTURE



FRAME SHALL BE
REVERSIBLE SO
THAT IT CAN BE
INSTALLED WITH
FLANG EITHER UP
OR DOWN.



➔

PULL BOX SIZE	A	B	C	D	E	F	G	H	APPROX. WT.
15"	20"	13 1/4"	1 1/2"	11 1/4"	14 1/2"	4"	5/8"	5/8"	80#
18"	23"	16 1/4"	1 1/2"	14 1/4"	17 1/2"	4"	5/8"	5/8"	105#
24"	28 1/2"	22 1/4"	1 1/2"	20 1/4"	23 1/2"	4"	5/8"	5/8"	195#
30"	34 1/2"	28 1/4"	1 1/2"	26 1/4"	29 1/2"	4"	5/8"	5/8"	270#

SPECIFICATIONS:

1. THIS CASTING IS DESIGNED FOR H-20 WHEEL LOADING.
2. MATERIAL SHALL BE CAST IRON, CONFORMING TO ASTM A48 CLASS 30
3. COMPLETE UNIT SHALL HAVE ONE COAT OF BLACK PAINT.

CIR ELECTRICAL CONSTRUCTION CORP.

LETTER OF TRANSMITTAL

2750 KENMORE AVE.
TONAWANDA, NY 14150

PHONE: (716) 874-5614
FAX: (716) 874-7624

DATE: 03/10/00	JOB NO.
ATTENTION: Mr. Larry Gee	
RE: Niagara County Land Fill	

TO: CRE
2055 Niagara Falls Blvd
Niagara Falls, NY

GENTLEMEN:

WE ARE SENDING YOU:

☐	SHOP DRAWINGS
☐	COPY OF LETTER
☐	SAMPLES

☒
☐
☐
☐

ATTACHED
PRINTS
CHANGE ORDER
SPECIFICATIONS

☐
☐
☐

UNDER SEPARATE COVER VIA
PLANS

THE FOLLOWING ITEMS:

COPIES	DATE	NO	DESCRIPTION
3			O & M Manuals for Exhaust Fan

THESE ARE TRANSMITTED....

☐
☒
☐

FOR APPROVAL
FOR YOUR USE
AS REQUESTED

☐
☐
☐
☐

APPROVED AS SUBMITTED
APPROVED AS NOTED
RETURNED FOR CORRECTIONS
FOR REVIEW AND COMMENT

☐
☐
☐

RESUBMIT
SUBMIT
RETURN
COPIES FOR APPROVAL
COPIES FOR DISTRIBUTION
CORRECTED PRINTS

☐

FOR BIDS DUE
PRINTS RETURNED AFTER LOAN TO US.

REMARKS:

SIGNED: Greg Jakubowski

CC:

CAPITAL SHEET METAL, INC.

2139 Lockport Road
Niagara Falls, NY 14304
(716) 731-3253

FAX COVER LETTER

DATE: 8/31/99 PAGE 1 OF 1
TO: C.I.R. Elec.
ATTN: Greg
FROM: Bob Cimini
SUBJECT: "N.C. Landfill"
Furnish + install
the following:

Item Qty

- 1 1 Continental Fan Mfg. model APD120, 12" dia., direct drive panel fan
Performance @ 70°F: 400 CFM, 1/2" SP, 1750 RPM, 0.08 BHP
Motor: 1/4 HP, 1800 RPM, TEFC, 375/3450, premium efficiency
Included in price: Epoxy coated steel housing 480
Adjustable pitch cast aluminum propeller
Rear / motorside safety guard
Damper mounting boot
Motorized damper - 115v
Weatherhood - assembly required by others -
- 2 1 Intake louver with filter, model EAL-40
Included in price: 24" x 24" square
Comes with or with out mounting flange
Belimo actuator 24v AC/DC

Post-It® Fax Note	7671	Date	# of pages ▶
To	LARRY GEE	From	CREA
Co./Dept.		Co.	JAKUBOWSKI
Phone #		Phone #	
Fax #		Fax #	

AEROFLO INC.

VENTILATION TECHNOLOGY

205 MATHESON BLVD. EAST, UNIT 15, MISSISSAUGA, ONTARIO, L4Z 3E3 TEL: (905) 890-6192 FAX: (905) 890-6193

August 6, 1999

Mr. Larry Fowler
Conestoga Rovers & Associates Limited
651 Colby Drive
Waterloo, Ont N2V 1C2
Canada

Tel: 519-884-0510
Fax: 519-884-0525

Re: ~~Rockaway, NJ~~ NORTH TARRANT, TX

Quotation number: QA99-0806

Larry, Hartzell does not make a panel fan for this low a performance. We have priced a Continental Fan in place.

Item Qty

1	1	Continental Fan Mfg. model APD120, 12" dia., direct drive panel fan Performance @ 70°F: 400 CFM, 1/2" SP, 1750 RPM, 0.06 BHP Motor: 1/4 HP, 1800 RPM, TEFC, 575/3/60, premium efficiency Included in price: Epoxy coated steel housing 480 Adjustable pitch cast aluminum propeller Rear / motorside safety guard Damper mounting boot Motorized damper - 115v Weatherhood - assembly required by others

Price per unit

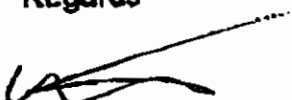
2	1	Intake louver with filter, model EAL-40 Included in price: 24" x 24" square Comes with or with out mounting flange Belimo actuator 24v AC/DC

Price per unit

Delivery from date of order approval
All pricing FOB Mississauga, Ontario, in Canadian dollars.
All taxes are extra.

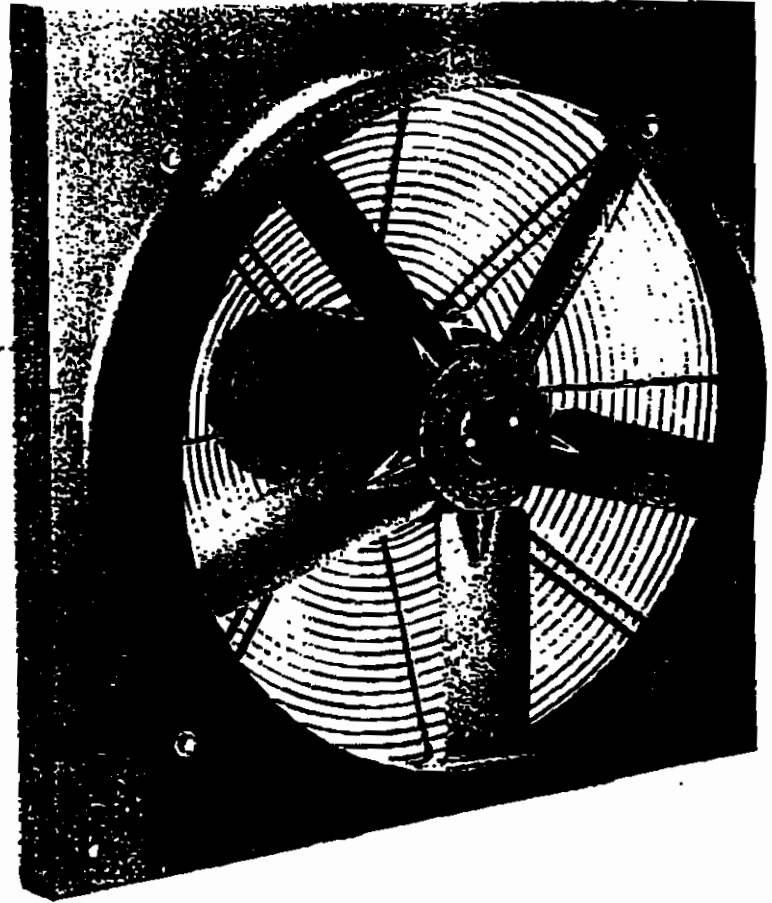
4 weeks

Regards



Warren DiMarco

GOOD THINGS, *small* PACKAGES.

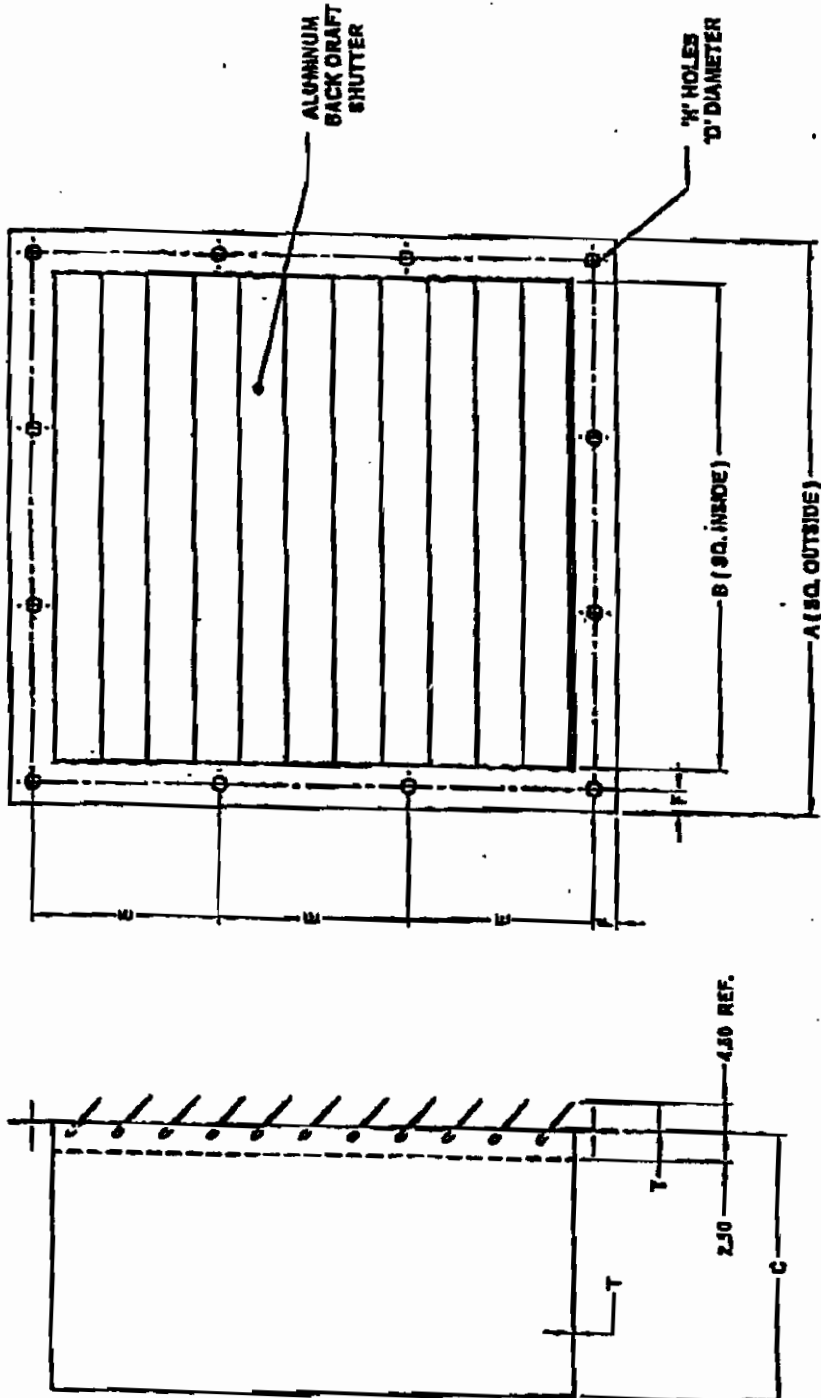


To build a superior compact fan, we discarded all conventional thinking and started with a clean sheet.

Beginning with a unique cast aluminum motor bracket combined with a heavy gauge conical safety guard, we designed the motor mount to be versatile, rigid and streamlined. We developed an efficient deep drawn venturi in heavy gauge steel, and specified a baked epoxy paint for outstanding appearance and durability. Standard frame TEFC motors are readily available in all three phase voltages, and permit motor wiring without guard removal.

Creative thinking has produced the compact, efficient and versatile AEROFAN.

ALUMINUM



STANDARD PAINT FINISH
PA-146-G
ASA 75 GREY

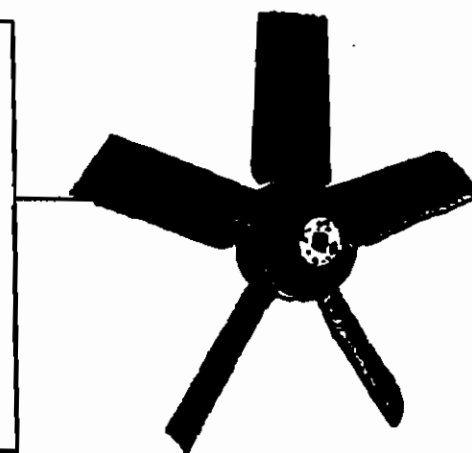
SIZE	PART NO.	A	B	C	D	E	F	H	T
12	APD120-02	19	16 1/8	11	7/16	8 3/4	3/4	8	0.080
14	APD140-02	21	18 1/8	11	7/16	9 3/4	3/4	8	0.080
16	APD160-02	23	20 1/8	11	7/16	10 3/4	3/4	8	0.080
18	APD180-02	26	22 1/8	12	5/8	8	1	12	0.075
21	APD210-02	29	25 1/8	12	5/8	9	1	12	0.075
24	APD240-02	32	28 1/8	12	5/8	10	1	12	0.075
27	APD270-02	37	32 1/8	12	5/8	11 1/2	1 1/4	12	0.075

APD		APD		APD	
MOUNTING		MOUNTING		MOUNTING	
BOOT WITH		BOOT WITH		BOOT WITH	
SHUTTER		SHUTTER		SHUTTER	
A-1023002		A-1023002		A-1023002	

ELTA IMPELLER

ELTA propellers are ruggedly constructed with cast aluminum hubs and steel taperlock bushings. A unique propeller removal jackscrew has been integrated into the hub to assist in servicing.

Quiet and efficient airfoil shaped blades are available in pressure cast aluminum or glass reinforced polypropylene (GRP). Propellers are available with 5 blades for low to medium pressures, or 10 blades for high pressures. Adjustable pitch permits exact performance matching through the ELTA computer selection program. All components are stocked for quick response.



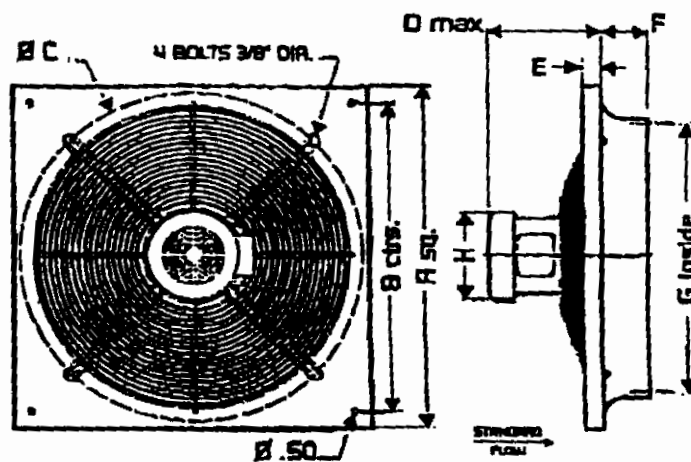
- ☒ user friendly software selection program
- ☒ quiet and efficient true airfoil blades
- ☒ "FMCRB" spark resistant
- ☒ adjustable pitch for exact performance
- ☒ choice of standard or reverse flow
- ☒ choice of 5 or 10 blades
- ☒ choice of GRP or cast aluminum blades
- ☒ taperlock bushing propeller mounting
- ☒ propeller removal jackscrew

Sample Specification

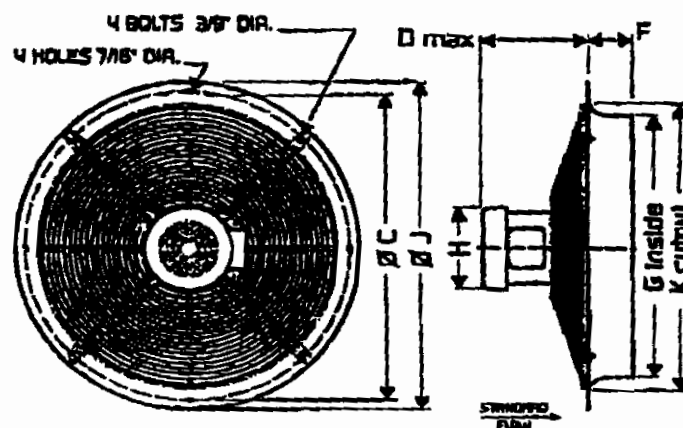
Fans shall be AEROFAN type (APD, APD, AFD, ANC) produced by Continental Fan Manufacturing Inc.. Propeller shall be adjustable pitch, with (glass reinforced polypropylene or pressure cast aluminum) blades, and pressure cast aluminum hub with Browning type taperlock bushing. Fan hub shall incorporate a propeller removal jackscrew to allow propeller removal without special tools. Venturi shall be deep drawn steel spinning finished in high gloss powder coat epoxy. Motor shall be three phase TEFC, supported by a cast aluminum motor bracket and heavy gauge powder coated OSHA guard. Guard shall be conical for maximum rigidity and minimum turbulence. Motor terminal box shall be accessible without guard removal.

CFM	dBA @ 5ft	0' S.P.		1/8" S.P.		1/4" S.P.		3/8" S.P.		1/2" S.P.		3/4" S.P.		1" S.P.		1 1/4" S.P.	
		BA	HP	BA	HP	BA	HP	BA	HP	BA	HP	BA	HP	BA	HP	BA	HP
400	58							10	0.04	18	0.08	19	0.10				
500	55					10	0.04	14	0.05	15	0.08						
600	55			10	0.04	12	0.05	18	0.07	18	0.10						
700	55	10	0.03	12	0.04	16	0.06	22	0.09	21	0.13						
800	55	13	0.03	15	0.05	19	0.06	26	0.11	24	0.15						
900	55	16	0.05	18	0.07	23	0.09	24	0.14	26	0.18						
1000	55	18	0.06	22	0.08	28	0.12	27	0.19	31	0.22						
1100	55	22	0.07	27	0.11	34	0.17	31	0.22	36	0.28						
1200	56	27	0.10	32	0.14	31	0.22	28	0.27								
1300	56	31	0.13	32	0.22	25	0.27										
CFM	dBA @ 5ft	0' S.P.		1/4" S.P.		1/2" S.P.		3/4" S.P.		1" S.P.		1 1/2" S.P.		2" S.P.		2 1/2" S.P.	
		BA	HP	BA	HP	BA	HP	BA	HP	BA	HP	BA	HP	BA	HP	BA	HP
600	70													13	0.40	11	0.50
800	70											10	0.33	17	0.51		
1000	70									10	0.30	14	0.44				
1200	69					10	0.27	11	0.31	13	0.38	18	0.44				
1400	68	10	0.20	11	0.26	12	0.33	14	0.41	16	0.49						
1600	69	13	0.28	14	0.35	15	0.43	17	0.51								
1800	67	16	0.37	17	0.45	19	0.54										
2000	67	19	0.47	20	0.56												
2200																	
2400																	

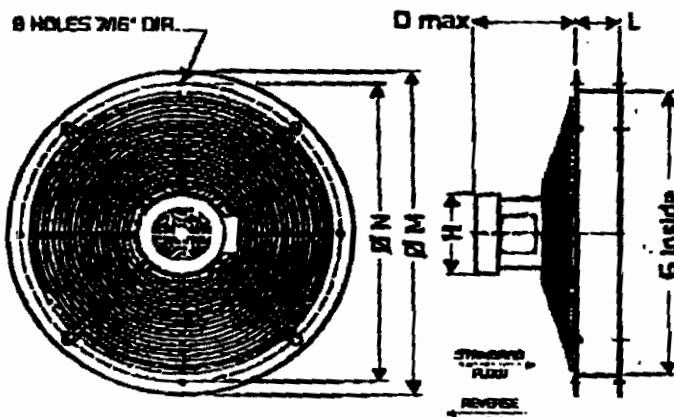
SIZE	A	B	C	D	E	F	G	H
120	16	13	16 1/4	8 1/8	1 1/2	2 1/2	12 1/4	6 1/2
143	18	15	17 1/2	10 7/8	1	2 1/2	14 1/4	7 3/8
163	20	17	20 3/4	10 3/8	1 1/4	3	16 1/4	7 3/8
183	22	19	22 3/4	9 7/8	1 1/4	3 1/2	18 1/4	7 3/8
213	25	22	25 3/4	9 7/8	1 1/2	4	21 1/4	7 3/8
243	28	25	28 3/4	9 7/8	1 1/2	4	24 1/4	7 3/8
245	28	25	28 3/4	10 7/8	1 1/2	4	24 1/4	7 3/8
273	32	29	31 3/4	9 7/8	1 1/2	4	27 1/4	7 3/8
275	32	29	31 3/4	10 7/8	1 1/2	4	27 1/4	7 3/8



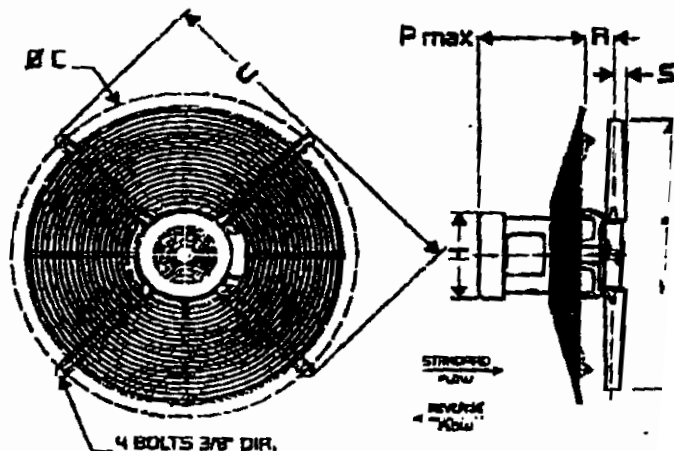
SIZE	C	D	F	G	H	J	K
120	16 1/4	8 1/8	2 1/2	12 1/4	6 1/2	18 1/2	15 1/8
143	17 1/2	10 7/8	2 1/2	14 1/4	7 3/8	19 1/2	16 1/8
163	20 3/4	10 3/8	3	16 1/4	7 3/8	22 1/2	18 5/8
183	22 3/4	9 7/8	3 1/2	18 1/4	7 3/8	24 1/2	21 5/8
213	25 3/4	9 7/8	4	21 1/4	7 3/8	28	24 5/8
243	28 3/4	9 7/8	4	24 1/4	7 3/8	30 1/2	27 5/8
245	28 3/4	10 7/8	4	24 1/4	7 3/8	30 1/2	27 5/8
273	31 3/4	9 7/8	4	27 1/4	7 3/8	34 1/2	30 5/8
275	31 3/4	10 7/8	4	27 1/4	7 3/8	34 1/2	30 5/8



SIZE	D	G	H	L	M	N
120	8 1/8	12 1/4	6 1/2	3	15	18 1/2
143	10 7/8	14 1/4	7 3/8	3	17 1/2	18 1/4
163	10 3/8	16 1/4	7 3/8	4	19	17 1/2
183	9 7/8	18 1/4	7 3/8	4	22	20 3/4
213	9 7/8	21 1/4	7 3/8	4	24 1/2	22 3/4
243	9 7/8	24 1/4	7 3/8	4	27 1/2	25 3/4
245	10 7/8	24 1/4	7 3/8	4	27 1/2	25 3/4
273	9 7/8	27 1/4	7 3/8	4	31	28 3/4
275	10 7/8	27 1/4	7 3/8	4	31	28 3/4



SIZE	C	H	P	R	S	T	U
120	18 1/4	6 1/2	8	1 1/8	1 1/2	12	17 1/2
143	17 1/2	7 3/8	10 3/4	7/8	1 1/2	14	19
163	20 3/4	7 3/8	10 1/4	1 3/8	1 1/2	16	22
183	22 3/4	7 3/8	9 3/4	1 7/8	1 1/2	18	24
213	25 3/4	7 3/8	9 3/4	2 3/8	1 1/2	21	27
243	28 3/4	7 3/8	9 3/4	2 3/8	1 1/2	24	30
245	28 3/4	7 3/8	10 3/4	2 3/8	1 1/2	24	30
273	31 3/4	7 3/8	9 3/4	2 3/8	1 1/2	27	33
275	31 3/4	7 3/8	10 3/4	2 3/8	1 1/2	27	33



Lubrication Instructions For Ball Bearing Motors

Grease-lubricated bearings, as furnished, are adequate for a long period of operation without relubrication. A good maintenance schedule for regreasing will vary widely depending on motor size, speed and environment.

The table listed below suggests re-lubrication intervals for motors on normal, steady running, light duty indoor loads in relatively clean atmosphere at 40° C. (105° F.) ambient temperature or less. Fractional horsepower motors follow a similar schedule to that shown under frames 143 to 215T.

Motors with no provision for lubrication are equipped with sealed bearings and require no maintenance. Motors mounted in inaccessible locations are provided with extended grease lines to facilitate lubrication. They are equipped with relief fittings to prevent over-lubrication. The grease lines are filled with lubricant at the factory.

PROCEDURE FOR RELUBRICATION

1. Stop motor.
2. Remove grease relief plugs in bearing housings.
3. Grease with hand gun until new grease appears at relief hole.
4. Run motor for ten (10) minutes before replacing relief plugs.

CAUTION: Do not overlubricate. This is a major cause of bearing and motor failure. Make sure dirt and contaminants are not introduced when adding grease.

TYPE OF GREASE

Lubricate with or equivalent to the following greases:

Chevron BRB-2 - Standard Oil of Calif.

SRI-2 - Standard Oil Company

Alvania #2 - Shell Oil Company

For motors lubricated with special greases check lubrication tag on motor.

Type of Enclosure	Insulation	FRAME SIZE		
		143 to 215T	254 to 326T	364 to 449T
Open - DP	B	2 years	18 months	1 year
Enclosed - FC	B			
Open - DP	F	18 months	1 year	9 months
Enclosed - NV	B			
Enclosed - FC	F			
Open - DP	H	1 year	9 months	6 months
Enclosed - Lint Free - FC	B			
Enclosed - NV	F			
Enclosed - FC	H			
Enclosed - Lint Free - FC	F	9 months	6 months	3 months

NOTE:

FOR MOTORS OVER 1800 RPM

Use 1/2 of tabled period.

FOR HEAVY DUTY -
DUSTY LOCATIONS

Use 1/2 of tabled period.

FOR SEVERE DUTY -
HIGH VIBRATION, SHOCK

Use 1/3 of tabled period.

VOLUME-REFERENCE TABLE

Shaft Diameter (At face of bracket)	Amount of Grease to Add
3/4" to 1 1/4"	1/8 cu. in. or 0.1 oz.
1 1/4" to 1 7/8"	1/4 cu. in. or 0.2 oz.
1 7/8" to 2 3/8"	3/4 cu. in. or 0.6 oz.
2 3/8" to 3 3/8"	2 cu. in. or 1.6 oz.

Lubrication Instructions For Fan Ball Bearings

Bearings and grease lines on belt driven fans are lubricated in assembly. When lubrication is required, add grease slowly while shaft is rotating until grease comes rapidly out of the seal.

For extreme conditions lubricate according to experience. For normal conditions, lubricate the bearings with or equivalent to: Chevron SRI-2 grease.

Bearings and grease lines on fans that are ordered for high-moisture or above-normal temperatures have been lubricated with a special lubricant, Plastilube #2. Lubricate at regular intervals with Plastilube #2 as indicated in the special lubrication chart listed on the following page. Plastilube #2 is available from Warren Refining Company, Division Parr Inc., 18400 Syracuse Avenue, Cleveland, Ohio 44110.

LUBRICATION SCHEDULE										
SHAFT SIZE INCHES	OPERATING SPEED (RPM)									
	500	1000	1500	2000	2500	3000	3500	4000	4500	5000
	RELUBRICATION CYCLE (MONTHS)									
1/2 thru 1	6	6	6	6	6	6	4	4	2	2
1 1/16 thru 1 7/16	6	6	6	6	6	6	4	4	2	1
1 1/2 thru 1 3/4	6	6	6	4	4	2	2	2	1	1
1 7/8 thru 2 1/16	6	6	4	4	2	2	1	1	1	
2 1/4 thru 2 7/16	6	4	4	2	2	1	1	1		
2 1/2 thru 3	6	4	4	2	1	1	1			
3 7/16 thru 3 1/2	6	4	2	1	1	1				
3 13/16 thru 4	6	4	2	1	1					

Consult manufacturer for specific recommendations

BEARING MOUNTING PROCEDURE

It is important to follow the assembly and alignment procedure when making an installation of replacement bearings. Inspect the shaft for wear at the bearing mounting positions. Shaft diameter should not be undersized more than commercial ground and polished tolerances. Excessive undersizing will result in rapid wear.

1. Place new bearings on shaft loosely. Locking collars may be located on either end of bearings for ease of installation. The illustration shows one locking collar on the drive end and one locking collar on the fan end, which is typical for a tubeaxial type fan. A typical SWSI centrifugal fan would have both collars mounted on the sheave side of the bearings. Drop mounting bolts in place, snug them and adjust the position of shaft with proper spacing at either end.
2. Center both ends of the shaft in the housing of tubeaxial fans using the propeller as a guide. On centrifugal fans, the shaft is positioned 90° to the scroll side with the wheel inlet centered in the scroll inlet. Use the clearance in the mounting holes for horizontal adjustment and shims, if necessary, for vertical adjustment.
3. Tighten the bearings to the base plate and check the position of the shaft again. Before tightening the locking collars, be sure the shaft and bearings are in proper alignment. The shaft should slide freely end to end.



4. Tighten the eccentric cam locking collar of the bearing at the propeller/wheel end. (The locking collar design provides a positive lock of the wide inner ring bearing to the shaft. To tighten, turn the locking collar in the direction of shaft rotation to the lock position then tighten the collar set screw.) Repeat this procedure for the sheave end locking collar on DWDI and open wheel centrifugals. For other fan types, proceed to Step 5.
5. Axial flow propellers and single inlet centrifugal wheels with back plates exerts an air thrust toward the fan inlet. To help balance the bearing loading, we allow the fan end bearing (belt drive units) to carry the majority of this thrust loading while the sheave end bearing carries most of the radial load. (Direct coupled units would be just the opposite.) To accomplish this, grasp the sheave end of the shaft and pull or push on it toward the fan inlet. At the same time, tap the locking collar of the sheave end bearing (fan end of direct coupled units) with a soft mallet in the opposite direction.

6. The final step is to tighten the sheave end bearing eccentric cam locking collar while maintaining constant pressure on the shaft toward the fan inlet.

For special heavy-duty bearings a spring locking collar is used. The two knurled cup-point set screws extend through the inner ring of the bearing and lock firmly onto the shaft. Tighten the propeller end collar first; then take hold of the sheave end of the shaft, pull and then tighten the locking collar. The locking collar is tightened by using the two set screws mentioned above.

BELT TENSION

Belt tension is very important to the proper operation of a fan and to the service life of a V-belt drive. A new fan will be received with its belts properly adjusted; however, all V-belts stretch in the first few hours of operation. It will be necessary to readjust the belt tension after eight hours of running. After 100 hours the belts should again be adjusted. Thereafter, periodic inspection is recommended so belts may be adjusted or replaced when necessary.

1. To adjust the belts, loosen the motor hold-down bolts. Tighten the belt, using the motor base adjusting screw until the belt appears to be taut. You should be able to deflect the belt slightly by squeezing the two sides between thumb and forefinger, and the belt should snap back into position when released.
2. Retighten the motor hold-down bolts and start the fan. If the belt screeches on start-up, it is too loose and should be tightened further.
3. Allow the fan to run for awhile, stop the fan, and check the temperature of the sheave with your hand. If the sheave gets too hot to touch, the belt is probably too tight.

V-belt drives on Continental fans are purposely sized to handle considerably more load than would be necessary for normal drive design. This is done to prolong the life of the drive and provide for minimum maintenance. Belts should be replaced when they have obviously become worn, even though they are still operating. A badly-worn belt will also cause undue wear of the sheave. Replace belts when they show definite signs of wear; otherwise, the sheaves will become worn to the place where they also must be replaced. Never put new belts on a badly-worn sheave. This will reduce the capacity of the drive and cause excessive belt wear.

Most Continental fans are provided with an adjusting screw as a part of the motor base for easy setting of belt tension. However, small fans or fans using small horsepower motors may not have this feature.

slotted base plate. When you adjust the belt tension by moving a motor on a slotted base, be sure that you block the motor tightly and squarely before tightening the hold-down bolts, keeping the motor sheave in line with the belt. The motor sheave must be parallel to and in line with the fan sheave.

When you make replacement of belts on a multi-groove drive, be sure they are used in a matched set. If you are not sure the belts are matched, observe them in operation. The tight side should be perfectly straight, and the belts should run smoothly and in line. The slack side should bow out and also be in line. If one of the belts extends out considerably farther than another, it is an indication that the belts are not matched and should be changed. If there is only a slight difference, the normal stretching in the first hours of operation will equalize the belt lengths and the belts will be well matched.

REPLACING BELTS AND BEARINGS

Worn belts may be easily replaced without removing fan from the system.

1. Loosen the motor hold-down bolts and move the motor toward the fan. (This is done by turning a jackscrew which is a part of the motor base on models having larger motors.) The belt may be slipped off the motor sheave and then easily removed from the sheave on the propeller shaft.
2. Check the numbers on the belt and make the replacement with a belt having the same length and section.
3. Adjust motor outward to tighten the belt (see instructions on belt tension), and tighten the motor hold-down bolts. Be sure that the motor is not cocked at an angle and that the end face of the motor sheave is parallel to the end face of the driven sheave.

Since the new belts have a tendency to stretch, it will be necessary to readjust the belt tension after a few hours of run-in.

Fan bearings may be lubricated from the outside through grease extension lines; however, if it is necessary to remove the fan bearings for cleaning or replacement, read the detailed instructions for bearing mounting procedure. Bearings are accessible through the access door in the fan. If there is no access door, then remove a section of duct from the inlet side or remove the fan entirely from the duct system.

1. On tubaxial fans, remove the machine screws holding the bearing cover. (If the fan has a shaft seal, you must remove the propeller, lift up the drive end of the bearing cover, and push it forward off the end of the shaft.)
2. Bearings are held in place with ordinary class 5 capscrews and locknuts. Use new capscrews and locknuts to make the replacement, particularly if these show signs of corrosion.
3. Before reconnecting the grease lines to new bearings, put a grease gun on the outside fittings and pump grease through the lines, making sure that all of the old grease is purged out and grease is up to the end of the line where it connects into the bearing. Be sure that you use proper grease - see BEARING LUBRICATION.

The belts, sheaves, bearings, and shaftings used in all Continental fans are of standard dimension and manufacture. New parts are available from the factory or from the local distributor of Browning drives and Link-Belt bearings.

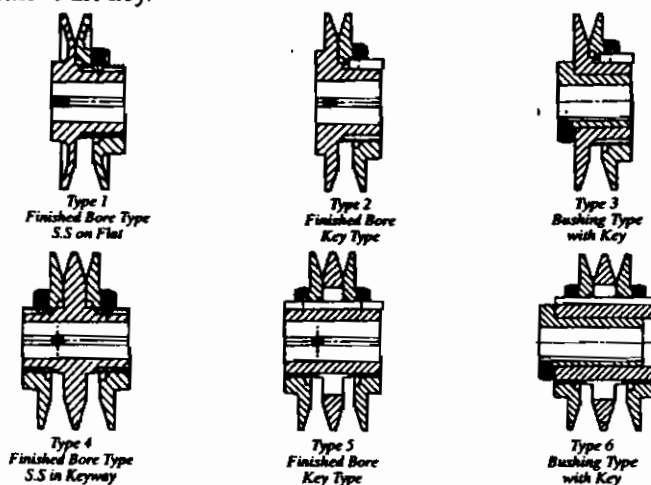
ADJUSTING VARIABLE PITCH SHEAVES

Many Continental belt driven fans are furnished with variable-pitch motor sheaves. Sheaves may be adjusted for lower fan speeds without concern of over-loading motors. When adjusting sheaves to increase fan speed, check motor current to be sure motor is not overloaded. Keep motor current within nameplate and service factor ratings.

The sheaves used are the VP type and are easily adjusted. They come in various styles, depending upon the size drive and motor shaft, all fitted with hollow head knurled point safety set-screws.

The following steps should be taken to adjust the pitch diameter:

1. Release belt tension and remove belt or belts from sheave.
2. Loosen setscrew and remove key holding adjustable half of the groove (keys used on styles 2, 3, 5, and 6 only). With styles 3 and 6 it may be necessary to remove the sheave from the shaft to remove the key.



3. Screw adjustable half of sheave out for a smaller pitch diameter (decreased speed), or in for a larger pitch diameter (increased speed). Each one-half turn will change the pitch diameter one-tenth of an inch. Adjust two-groove sheaves the same amount on each groove. 4L or A belts will operate satisfactorily with the sheave fully closed to a maximum of five full turns open. 5L or B belts will operate satisfactorily with the sheave one full turn open to a maximum of six full turns open. (This will insure full contact of the sheave in the groove.)

4. Replace the key and tighten the setscrew to lock sheave half in position.

5. Replace the belts and tighten setscrew to proper tension. If extreme amount of adjustment has been made, it may be necessary to replace belts with another length.

NOTE: Heavy-duty drives requiring three-groove sheaves, motor sheaves larger than 7" pitch diameter, or belts larger than B section require MVP sheaves and are available only on special order.

TYPICAL MOTOR CURRENT AND STARTER SIZE

Amperes shown are nominal and were used for sizing of the starters only. These values are **not** to be used for sizing heaters or other overload protection. Consult the motor nameplate for the correct motor current and refer this to the heater size chart for the particular starters used.

NOTE: When sizing overload heaters, conditions under which the starters will operate must be considered. Enclosed starters should have heaters one size larger than open starters. Where enclosures are subjected to external heat, such as radiant heat from the sun or heat accumulation under a roof, it may be necessary to increase the size even more. Experience with the operating conditions and measurement of the actual line current will aid in proper sizing of heaters.

HP	Three Phase						Single Phase			
	230V		460V		575V		115V		230V	
	Amps	Starter	Amps	Starter	Amps	Starter	Amps	Starter	Amps	Starter
1/4		00		00		00	5.8	00	2.9	00
1/2	1.7	00	.9	00		00	7.2	00	3.6	00
3/4	2.0	00	1.0	00	.8	00	9.8	0	4.9	00
1	2.8	00	1.4	00	1.1	00	13.6	0	6.9	00
1 1/2	3.5	00	1.8	00	1.4	00	16.0	0	8.0	00
2	5.0	00	2.5	00	2.0	00	20.0	1	10.0	0
3	6.5	0	3.3	00	2.6	00	24.0	1	12.0	0
5	9.0	0	4.5	0	4.0	0	34.0	1	17.0	1
7 1/2	15.0	1	7.5	0	6.0	0			28.0	1
10	22.0	1	11.0	1	9.0	1			40.0	2
15	27.0	2	14.0	1	11.0	1			50.0	3
20	40.0	2	20.0	2	16.0	2				
25	52.0	3	26.0	2	21.0	2				
	64.0	3	32.0	2	26.0	2				

(For larger mtr. sizes, refer to National Electric Code.)

INSTALLATION INSTRUCTIONS FOR IMPELLERS EQUIPPED WITH BROWNING MALLEABLE IRON SPLIT TAPER BUSHINGS

Many Continental fans are furnished with split taper bushings for mounting the impeller to the shaft. When properly assembled, the bushings grip the hub with a positive clamping action.

A. Bushing barrel and bore of impeller are tapered - this assures concentric mounting and a true running propeller IF THE PROPER TIGHTENING PROCEDURE IS FOLLOWED.

B. Capscrews, when tightened, lock bushing in propeller. Use special plated capscrews threaded full length furnished by Continental Fan Manufacturing Inc.

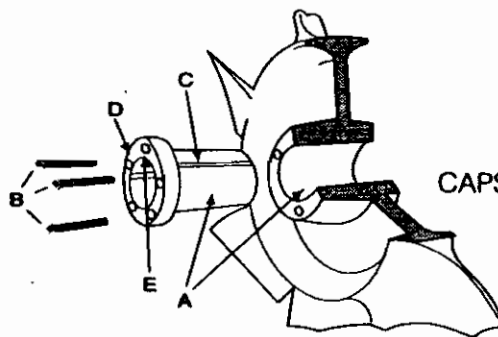
BUSHING NO.	BOLT SIZE	TORQUE FT. LBS
H	1/4 - 20	7 1/2
P-1	3/16 - 18	13
P-2	3/16 - 18	13
Q-2	3/8 - 16	24
R-2	3/8 - 16	24

C. Bushing is split so that when the locking capscrews force bushing into tapered bore, the bushing grips the shaft with a positive clamping fit - this will withstand vibration and punishing loads without being loosened.

D. Impeller and bushing assembly is keyed to the shaft and held in place by compression - this gives added driving strength.

Before assembly be sure shaft and keyway are clean and smooth. Check key size with both shaft and bushing keyways.

E To assemble, put the capscrews through the clearance holes in the bushing and put bushing loosely into impeller. Do not press or drive. Start capscrews by hand, turning them just enough to engage threads. Do not use a wrench at this time. The bushing should be loose enough in the propeller to move slightly. Slide impeller and bushing assembly onto shaft, making allowance for end play of shaft to prevent rubbing. Install key into keyway. Do not force impeller and bushing onto shaft. If it does not go on easily, check shaft, bushing, and key sizes once again.



**DO NOT
LUBRICATE
CAPSCREWS, BORE,
OR BUSHING
BARREL**

Tighten capscrews progressively with torque wrench. Do this evenly as in mounting an automobile wheel. Take a part turn on each capscrew successively until all are tightened to the torque specified in the table at left. These capscrews force the taper bushing into the hub which in turn compresses the bushing onto the shaft. This makes a positive clamping fit. It is critical to a good installation that bolts be tightened to the correct torque.

WARNING: Do no attempt to pull bushing flange flush with hub end - there should be a clearance which varies approximately 3/16" to 1/4" with the bushing size when tightened. (Note, this is not a locating dimension.)

REMOVING IMPELLER ASSEMBLY FROM SHAFT

1. Remove all capscrews from impeller and hub assembly.
2. Start capscrews into the threaded holes into the bushing flange.
3. Tighten each bolt part of a turn successively to force the impeller off the bushing. This forces the bushing loose from the propeller and releases the compression so that the entire assembly will slide from the shaft.
4. Pull the bushing off the shaft. If the assembly has been in place some time it may be necessary to use a wheel puller to remove the bushing. Never use a wheel puller on the impeller.

STORAGE OF EQUIPMENT

If a fan is not installed immediately upon receipt, it is the responsibility of the purchaser/user to see to it that proper procedures are followed to minimize deterioration which may result from idle storage. These simple steps should be adhered to in order to protect the equipment.

1. Machined parts that are exposed to the elements should be covered with a protective coating of grease (Chesterton Heavy Duty Rustguard #740, Sprayon #322, or equivalent).

For fans equipped with access panels, vane section access panels, or core end covers, these can be removed to gain adequate access to the interior. These panels/covers should be reattached for storage, but fastened with a minimum of assembly hardware to facilitate access. The remaining hardware should be bagged and attached to the fan to prevent loss of these items, along with a tag indicating that all hardware should be reinstalled prior to putting the fan into service.

2. Equipment must be protected from construction debris. Ideally, equipment should be stored in a dry well-sheltered, vibration-free location.
3. Each impeller blade should be numbered in sequence with a felt-tipped marker.
4. A plastic cover should be spread over the equipment.

Fan Bearings

Since bearings tend to "breathe" on equipment stored in areas with other than a constant temperature, moisture will condense internally. Therefore, it becomes necessary to keep the bearings completely full of grease and periodically rotated to make certain that all internal parts are coated with grease. Even a full bearing will eventually pick up moisture and, therefore, must be periodically purged with new grease.

Grease should be purged from bearings to remove condensed moisture, and fan wheel rotated by hand every thirty (30) days. This practice should be done more often if weather is severe or if there is a wide variation in temperature.

CAUTION IN PURGING: The fan should be rotated while greasing, and high pressure pneumatic greasers should be avoided. See section on LUBRICATION INSTRUCTIONS FOR FAN BALL BEARINGS.

For rotating, follow the procedure listed below:

The blade marked number 1 should be rotated to top center. The blade number and date should be recorded in a log book which is to be stored in a protective pouch attached to the fan. During storage, the fan impeller should be rotated by hand at least ten (10) revolutions every thirty (30) days to circulate the lubricant in the bearings in the motor or on the fan shaft. After the tenth revolution stop with a blade at top center which is not the same one as is listed for the previous date in the log book.

Fans which are V-belt driven should be prepared for storage as follows. Carefully remove the belts, coil them (without kinks) in matched sets, and place them in a heavy carton. Mark carton with fan identification and store carton in a dry, well-ventilated area. Belts must not be left exposed to sunlight or subjected to storage ambient conditions exceeding 85°F., 70% relative humidity. Belts which show signs of deterioration should be replaced prior to start-up. Before reinstalling belts, review section on BELT TENSION.

NOTE: Procedures for storage of Continental equipment as outlined above are intended as a general guide only. Storage conditions will vary depending on the location. Common sense and practical experience should determine to what extent the above procedures will be followed.

Motors

Motors must be stored under cover in a clean, dry, vibration free location. Remove sufficient packaging material to allow circulation of air around motor. Maintain the temperature of the windings a few degrees above that of the surrounding air to protect against condensation. If the motor is equipped with internal heaters, the heaters should be energized throughout the storage period to prevent this condensation. If the motor does not have internal heaters, this can be accomplished using any other safe, reliable method of heating. Measure and record monthly the ambient air temperature and winding temperature.

In the event that the motor is not equipped with internal heaters and space heating equipment is unavailable, wrap the motor as tightly as possible with heavy-duty polyethylene. Enclose bags of dessicant (such as silicagel) with the motor to minimize moisture problems. Check the dessicant regularly and replace it periodically as dictated by climate requirements.

To prevent rusting of bearing parts, the rotor must be rotated at regular intervals (30 days) to assure these parts are well covered with oil or grease.

Prior to energizing the motor, it is to be inspected and meggered by a motor manufacturer's field service engineer. The charges for this service to the customer will be in accordance with manufacturer's published service rates in effect at the time of inspection.

In addition, it is strongly recommended that the motor manufacturer be contacted for specific long-term storage instructions.

INITIAL OPERATION

All Continental fans are lubricated at the factory, and have been given a run-in test before shipment. Read carefully all Installation and Maintenance Manuals before following the start-up check list.

Start-Up Check List

1. Inspect the equipment for any shipping damage. Remove any foreign material such as tags or packing from any moving parts or from within the fan housing.
 2. Compare the voltage, hertz, and phase stamped on the motor with the current characteristics of the line to which the motor is to be connected.
 3. Lock out power source at disconnect switch.
 4. Turn motor, drive, and impeller by hand to see that no misalignment has taken place in shipment. Check V-belt drive for proper alignment and belt tension.
 5. Check all bolts, screws, and fasteners, and tighten if necessary. Make certain all setscrews, locking collars and bearing mounting bolts are secure.
 6. Secure and check clearance of access doors, belt guards and inlet and outlet guards.
 7. Jog the fan electrically and note rotation. Reverse two electrical leads, if necessary, to obtain proper rotation as marked with rotation arrow on fan. Do not allow the impeller to run backwards except momentarily.
 8. **Centrifugal Fans:** Close dampers as required for adequate system resistance to prevent motor from overloading.
- Caution:** With fans that use the forward-curve or radial type of wheel, it is possible to overload the motor if the fan is operated at a lower static pressure than that which the fan is rated. Check catalog rating of the fan for proper speed and resistance.
9. Start the fan and observe its operation.
 10. Take motor amp reading and compare with amp rating on motor. (actual running amps should not exceed motor nameplate amps x service factor, exceptions may be taken for air over motors.)

Fan Balance

Fan impellers are statically and dynamically balanced within acceptable tolerances at the factory. Damage in shipping and handling or poor installation of the unit may upset the unit balance. An impeller that is not properly balanced can lead to excessive vibration causing undue wear on the entire unit. It is recommended that a vibration test be made on the fan after installation by an experienced technician.

CAUTION: For units furnished less final drive components at customer request, the addition of drive components in the field can create critical vibration modes. Continental Inc, strongly recommends a final unit balance procedure after all rotating components are installed. Failure to do so voids Continental's

All Continental fan assemblies are factory balanced to quality grade G6.3 (mm/sec., vel.) in accordance with ISO 1940-1973 standards. Selected values of fan rpm and corresponding total displacement (mils - peak to peak) and peak velocity (in./sec.) for quality grade G6.3 are charted below.

Fan RPM	Total Displacement (Mils-Peak-To-Peak)	Peak Velocity (In./Sec.)
3600	.66	.124
1800	1.32	.124
1200	1.97	.124
900	2.63	.124
700	3.38	.124

Vibration measurements, when possible, should be taken at each fan shaft bearing in two planes perpendicular to the axis of rotation (planes to have 90 degree interval), and one measurement parallel to the axis of rotation. On direct drive units the perpendicular measurements will be taken at each end of the motor casing, taking care not to take measurements on the fan shroud on TEFC motors. The axial measurement can be taken on the motor foot or mounting base. In some cases, primarily on axial flow units, it will not be possible to take measurements at the bearings or motor. On these units, the measurements should be taken on the inner shell near the bearings. If this is not possible, then take the readings on the outer shell near the bearing locations.

If vibration is excessive, shut down the fan and determine the cause.

Common causes of excessive vibration:

- A. Support structure not sufficiently rigid or level. Vibration amplified by resonance in duct work or support structure.
- B. V-belt drive misalignment. Belt tension too tight or too loose.
- C. Bearing locking collar or mounting bolts loose. Impeller setscrew loose.
- D. Material accumulation on impeller.
- E. Centrifugal Fans: Wheels rubbing on inlet cone.

Motors

Most integral horsepower totally-enclosed motors, fan-cooled, or fan-duty, have drain plugs in the end bells for drainage of condensation. On all roof ventilators the bottom or lower plug has been removed for continuous drainage.

All other style fans are shipped with the drain plugs installed. The user should remove the proper drain plug. For horizontally mounted units with the motor in the airstream, remove the down stream drain plug. For vertically mounted units, remove the bottom or lower drain plug.

With motors supplied by user, drain plugs may not have been provided. Check with the motor manufacturer regarding drainage and condensation.



Safety First



The operation and maintenance of machinery of any kind requires a person to be cautious and aware of the dangers that exist. The very nature of air-handling fans and their appurtenances presents a hazard to installation and maintenance personnel because they contain high-speed rotating parts. Because of the necessary application of a fan to its functional purpose, it is not always possible to completely protect the careless worker. The following precautions are very important:

1. Never apply power to the fan motor for any reason until the fan has been completely installed in its system, and the system inspected to be sure that no debris has been left in the ducts, and it is known that the guards at the entrance and the discharge of the air passages are in place. The usual procedure is to padlock the disconnect switch open until the installation is completed and inspected.
2. Start the fan momentarily and disconnect it. Observe rotation of the wheel or the drive to be sure rotation is correct. Do not allow the fan to run backward, except momentarily.
3. Do not open access or inspection doors while the fan is running.
4. Do not block the entrance to or the discharge of the fan or its connecting system.
5. Always open the disconnect switch and lock it in the open position with a padlock before doing any service or maintenance work on the fan.
6. Never remove the belt guard for maintenance or adjustment unless you know the disconnect switch is locked in the open position.
7. Never remove air passage guards or reach into the propeller unless you have locked the disconnect switch open.
8. Never remove and replace the propeller or the sheaves without studying thoroughly the section in the general maintenance sheets covering installation and removal of the Browning taper lock bushings.
9. Never remove or replace the shaft without studying thoroughly the section covering the proper assembly of shaft and bearings in the general maintenance sheets, and particularly the method of securing the bearing locking collars.
10. Never pry a belt over the edge of the sheave to remove or replace it. Use the belt adjustment screws or loosen the motor mounting bolts to provide the necessary slack; then retighten the new belt according to belt adjustment instructions.
11. Never turn any of the adjustment or mounting screws when the fan is running.
12. After service of any kind make certain that all adjustments have been properly made, bushing bolts, mounting bolts and adjustment screw have been properly tightened, belt guard and air passage guards have been replaced, access doors closed, there is no debris in the air passages, and all tools have been removed before unlocking the disconnect switch to place the fan in operation.
13. If the fan is used to handle corrosive fumes, be sure all joints in the air passage system are tight.
14. Be sure you are getting proper pick up at the inlet hoods.
15. Be sure the discharge is connected to a suitable fume scrubber or to the atmosphere in such a way as to not present danger to personnel or property.
16. Make a periodic inspection of the fan wheel, bearings and drive to be sure that corrosion has not set in to weaken them.
17. Where there are signs of corrosion there is danger of mechanical failure. Corroded parts should be replaced.
18. Always use caution in every maintenance or operational procedure. It is highly recommended that each worker have his own padlock and key, and that he place it on the disconnect switch wired to the fan that he is servicing. Lock the switch in the open position before doing any service or maintenance work.
19. Work safely; be considerate and aware of those people working with you and around you.



NOTE

If lubrication instructions are shown on the motor nameplate, they will supersede this general instruction.

Marathon Electric motors are pregreased with a polyurea mineral oil NGL grade 2 type grease unless stated otherwise on the motor nameplate. Some compatible brands of polyurea mineral base type grease are: Chevron SRI #2, Rykon Premium #2, Shell Oil Dolium R or Texaco Polystar RB.

motors are properly lubricated at the time of manufacture. It is not necessary to lubricate at the time of installation unless the motor has been in storage for a period of 12 months or longer (refer to lubrication procedure that follows).

LUBRICATION PROCEDURES

Stop motor. Disconnect and lock out of service. Remove contaminants from grease inlet area.

Remove filler and drain plugs.

Check filler and drain holes for blockage and clean as necessary.

Add proper type and amount of grease. See the Relubrication Time Intervals table for service schedule and Relubrication Amounts table for volume of grease required.

Wipe off excess grease and replace filler and drain plugs (see following warning).

Motor is ready for operation.

WARNING

If motor is nameplated for hazardous locations, do not run motor without all of the grease or drain plugs installed.

RELUBRICATION TIME INTERVAL AND AMOUNTS (For motors with regreasing provisions).

Service Condition	NEMA FRAME SIZE					
	140-180	210-360		400-510		
Over 1800 RPM and less	Over 1800 RPM	1800 RPM and less	Over 1800 RPM	1800 RPM and less	Over 1800 RPM	Over 1800 RPM
Standard	3 yrs.	6 months	2 yrs.	6 months	1 yr.	3 months
Severe	1 yr.	3 months	1 yr.	3 months	6 months	1 month
Seasonal	See Note 2.					

NOTE

1. For motors nameplated as "beltd duty only divide the above intervals by 3.
2. Lubricate at the beginning of the season. Then follow service schedule above.

SEASONAL SERVICE: The motor remains idle for a period of 6 months or more.

STANDARD SERVICE: Up to 16 hours of operation per day, indoors, 100°F maximum ambient.

SEVERE SERVICE: Greater than 16 hours of operation per day. Continuous operation under high ambient temperatures (100° to 150°F) and/or any of the following: dirty, moist locations, high vibration (above NEMA standards), heavy shock loading, or where shaft extension end is hot.

RELUBRICATION AMOUNTS

(For motors with regreasing provisions).

NEMA FRAME SIZE	VOLUME cu. in. (fluid oz.)	NEMA FRAME SIZE	VOLUME cu. in. (fluid oz.)
140	.25 (.14)	320	1.50 (.83)
180	.50 (.28)	360	1.75 (.97)
210	.75 (.42)	400	2.25 (1.2)
250	1.00 (.55)	440	2.75 (1.5)
280	1.25 (.69)	500	3.00 (1.7)

INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS FOR 320 FRAME AND SMALLER MOTORS

WARNING

These instructions must be followed to ensure safe and proper installation, operation and maintenance of the motor. They should be brought to the attention of all persons who install, operate or maintain this equipment.

Failure to follow instructions and safe electrical procedures could result in serious injury or fatality. Disconnect all power and discharge all capacitors before servicing. Install and ground per local and national codes. Consult qualified personnel with questions or if repairs are required.

INSTALLATION

UNCRAFTING AND INSPECTION

After uncrafting, check for any damage which may have been incurred in handling. The motor shaft should turn freely by hand. Repair or replace any loose or broken parts before attempting to use the motor.

Check to be sure that motor has not been exposed to dirt, grit, or excessive moisture in shipment or storage before installation.

Measure insulation resistance (see operation). Clean and dry the windings as required.

Never start a motor which has been wet without having it thoroughly dried.

SAFETY

Motors should be installed, protected and fused in accordance with latest issue of National Electrical Code, NEMA Standard Publication No. MG 2 and local codes.

Eyebolts or lifting lugs are intended for lifting the motor only. These lifting provisions should never be used when lifting or handling the motor with other equipment (i.e. pumps, gear boxes, fans or other driven equipment) as a single unit. Be sure the eyebolt is fully threaded and tight in its mounting hole. Eyebolt lifting capacity rating is based on a lifting alignment coincident with the eyebolt centerline. Eyebolt capacity decreases as deviation from this alignment increases. See NEMA MG 2.

Frames and accessories of motors should be grounded in accordance with National Electrical Code (NEC) Article 430. For general information on grounding refer to NEC Article 250.

Rotating parts such as pulleys, couplings, external fans, unusual shaft extensions should be permanently guarded. Keep hands and clothing away from moving parts. Electrical repairs should be made by trained, qualified personnel only.

LOCATION

In selecting a location for the motor, consideration should be given to environment and ventilation. A motor with the proper enclosure for the expected operating condition should be selected.

The ambient temperature of the air surrounding the motor should not exceed 40°C (104°F) unless the motor has been especially designed for high ambient temperature applications. The free flow of air around the motor should not be obstructed.

The motor should never be placed in a room with a hazardous process, or where flammable gases or combustible material may be present, unless it is specifically designed for this type of service.

1. Drip-proof (open) motors are intended for use indoors where atmosphere is relatively clean, dry and non-corrosive.

2. Totally enclosed motors may be installed where dirt, moisture and corrosion are present.

3. Totally enclosed - severe duty motors are recommended for extreme environmental conditions. 4. Explosion proof motors are built for use in hazardous locations as indicated by Underwriters' label on motor. Consult UL, NEC, and local codes for guidance.

FLOOR MOUNTING

Motors should be provided with a firm, rigid foundation, with the plane of four mounting pads flat within .010" for 56 to 210 frame; .015" from 250 through 320 frame. This may be accomplished by shims under the motor feet.

V-BELT DRIVE

1. Align sheaves carefully to avoid axial thrust on motor bearing. The drive sheave on the motor should be positioned toward the motor so it is as close as possible to the bearing.

2. When adjusting belt tension, make sure the motor is secured by all mounting bolts before tightening belts.

3. Adjust belt tension to belt manufacturer's recommendations. Excessive tension will decrease bearing life.

4. Sheaves should be in accordance to NEMA Spec. MG-1 or as approved by the manufacturer for a specific application.

DIRECT CONNECTED DRIVE

Flexible or solid shaft couplings must be properly aligned for satisfactory operation. On flexible couplings, the clearance between the ends of the shafts should be in accordance with the coupling manufacturer's recommendations or NEMA standards for end play and limited travel in coupling.

Misalignment between direct connected shafts will cause increased bearing loads and vibration even when the connection is made by means of a flexible coupling. Excessive misalignment will decrease bearing life. Proper alignment, per the specifications of the coupling being used, is critical.

ELECTRICAL CONNECTIONS

1. All wiring, fusing, and grounding must comply with National Electrical Codes and local codes.
2. To determine proper rotation and voltage connections, refer to the information and diagram on the nameplate, separate connection plate or decal. If the plate or decal has been removed, contact the manufacturer for assistance.
3. Use the proper size of line current protection and motor controls as required by the National Electrical Code and local codes. Recommended use is 125% of full load amps as shown on the nameplate for motors with 40°C ambient and a service factor over 1.0. Recommended use is 115% of full load amps as shown on the nameplate for all other motors. Do not use protection with larger capacities than recommended. Three phase motors must have all three phases protected.

Wire Size For 115 & 230 Volt Single Phase Circuits									
Motor	Distance - Motor To Fuse or Meter Box - Feet								
	100 Ft.	200 ft.	300 Ft.	500 Ft.	115V.	230V.	115V.	230V.	500 Ft.
HP	115V.	230V.	115V.	230V.	115V.	230V.	115V.	230V.	500 Ft.
1/4	#14	#10	#12	#8	#8	#10	#6	#8	#8
1/3	#12	#10	#12	#6	#6	#10	#4	#8	#8
1/2	#10	#8	#10	#6	#6	#8	#4	#6	#6
3/4	#10	#6	#10	#4	#4	#8	#2	#6	#6
1	#8	#6	#8	#4	#4	#6	#4	#4	#4
1-1/2	#4	#0	#8	#6	#6	#4	#2	#2	#2
2	#8	#6	#6	#4	#4	#2	#2	#2	#2
3	#8	#6	#6	#4	#4	#2	#2	#2	#2
5	#6	#4	#4	#2	#2	#2	#2	#2	#2

THERMAL PROTECTOR INFORMATION

WARNING

Disconnect power before working on motor driven equipment. Motors with automatic thermal protectors will automatically restart when the protector cools. Do not use motors with automatic thermal protectors in applications where automatic restart will be hazardous to personnel or equipment. Motors with manual thermal protectors may start unexpectedly after protector trips. If manual protector trips, disconnect motor from power line. After protector cools (five minutes or more) it can be reset and power may be applied to motor.

THERMAL PROTECTOR INFORMATION

The nameplate will indicate one of the following:

1. Motor is thermally protected
2. Motor is provided with overheat protective device

For example:

1. Motors without thermal protection have nothing stamped on nameplate about thermal protection.
2. Motors equipped with built-in thermal protection have "THERMALLY PROTECTED" stamped on the nameplate. Thermal protectors open the motor circuit electrically when the motor overheats or is overloaded. The protector cannot be reset until the motor cools. If the protector is automatic, it will reset itself. If the protector is manual, press the red button to reset.
3. Motors that are provided with overheat protective device that does not open the motor circuit directly will indicate "WITH OVERHEAT PROTECTIVE DEVICE". See motor connection diagram for details

CHANGING ROTATION

1. Keep hands and clothing away from rotating parts.
2. Before the motor is coupled to the load, determine proper rotation.
3. Check rotation by jogging or bumping. Apply power to the motor leads for a short period of time, enough to just get motor shaft to rotate a slight amount to observe shaft rotating direction.
4. Three phase - interchange any two (2) of the three (3) line leads. Single phase - reconnect per the connection diagram on the motor.

REDUCED VOLTAGE STARTING

Motors used on reduced voltage starting, should be carefully selected based upon power supply limitations and driven load requirements. The motors starting torque will be reduced when using reduced voltage starting. The elapsed time on the start step should be kept as short as possible and should not exceed 5 seconds. It is recommended that this time be limited to 2 seconds. Refer to the manufacturer for application assistance.

OPERATION

BEFORE INITIAL STARTING

1. If a motor has become damp in shipment or in storage, measure the insulation resistance of the stator winding
$$\text{Minimum Insulation Resistance} = 1 + \frac{\text{Rated Voltage}}{1000}$$

In Megohms

Do not attempt to run the motor if the insulation resistance is below this value. Have the motor inspected, dried and/or cleaned. Contact a qualified motor repair shop.

2. See that voltage and frequency stamped on motor and control nameplates correspond with that of the power line.
 3. Check all connections to the motor and control with the wiring diagram.
 4. Be sure rotor turns freely when disconnected from the load. Any foreign matter in the air gap should be removed.
 5. Leave the motor disconnected from the load from the initial start (see following caution). Check for proper rotation. Check for correct voltage (within $\pm 10\%$ of nameplate value) and that it is balanced within 1% at the motor terminals. After the machine is coupled to the load, check that the nameplate amps are not exceeded. Recheck the voltage level and balance under load per the above guidelines.
- Shut down the motor if the above parameters are not met or if any other noise or vibration disturbances are present. Consult NEMA guidelines or the equipment manufacturer if any questions exist before operating equipment.

ALLOWABLE VOLTAGE AND FREQUENCY RANGE

If voltage and frequency are within the following range, motors will operate, but with somewhat different characteristics than obtained with correct nameplate values.

1. Voltage: Within 10% above or below the value stamped on the nameplate. On three phase systems the voltage should be balanced within 1%. A small voltage unbalance will cause a significant current unbalance.
2. Frequency: Within 5% above or below the value stamped on the nameplate.
3. Voltage and Frequency together: Within 10% (providing frequency above is less than 5%) above or below values stamped on the nameplate.

CLEANLINESS

Keep both the interior and exterior of the motor free from dirt, water, oil and grease. Motors operating in dirty places should be periodically disassembled and thoroughly cleaned.

NOTE

Explosion proof motors should only be disassembled by an authorized service station.

CONDENSATION DRAIN PLUGS

All explosion proof and some totally enclosed motors are equipped with automatic drain plugs. They should be free of oil, grease, paint, grit and dirt so they don't clog up. The drain system is designed for normal floor (feet down) mounting. For other mounting positions, modification of the drain system may be required, consult the manufacturer.

SERVICE

WARNING

Disconnect power before working on motor or driven equipment. Motors with automatic thermal protectors will automatically restart when the protector temperature drops sufficiently. Do not use motors with automatic thermal protectors in applications where automatic restart will be hazardous to personnel or equipment.

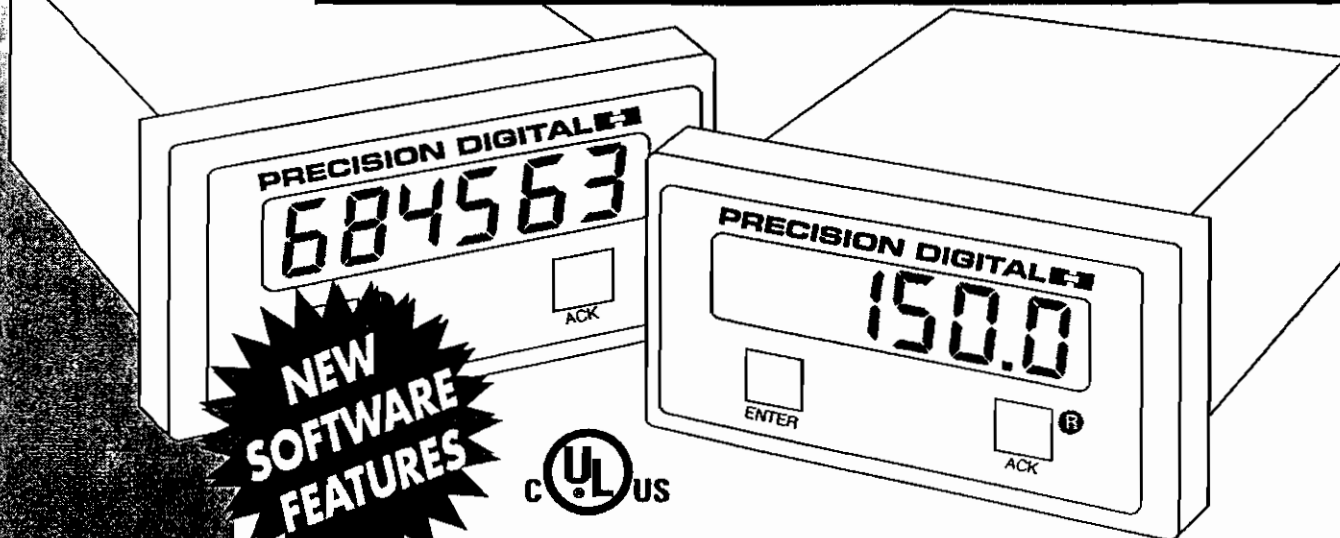
CAUTION

Overgreasing bearings can cause premature bearing and/or motor failure. The amount of grease added should be carefully controlled.

SECTION E7
CONTROL PANEL AND COMPONENTS

SIX DIGIT UNIVERSAL RATE/TOTALIZER/BATCH CONTROLLERS

MODEL PD692 ANALOG INPUT



MODEL PD693 FREQUENCY/PULSE INPUT

PD692 Analog Input & PD693 Frequency/Pulse Input

- Full six digit total display; 4¹/₂ + extra zero rate display
- Alternating rate/total display
- NEMA 4X, Type 4X front panel
- 11 point calibration for non-linear inputs
- 2 or 4 relay output options
- **Any relays programmable for rate or total**
- Latching and non-latching relays
- Time base in seconds, minutes, hours and now DAYS
- **Enhanced Priority Batch Programming**
- Totalizer reset via menu, external contact or automatically
- **Calibration Bail-out with one touch**
- **Easy access to full Diagnostic Menu**
- 115 or 230 VAC power; 24 VDC power available

PD692 Analog Input

- 4-20 mA, 1-5 V, 0-5 V, or 0-10 V Field Selectable Inputs
- Isolated 24 V transmitter power supply on AC models
- **Programmable Root Function for Weirs and Flumes**
- Automatic Square Root Extraction
- Internal or external calibration
- **Pump Alternation Function**
- 4-20 mA output option

PD693 Frequency/Pulse Input

- Pulse, Open Collector, TTL or Square Wave Field Selectable Inputs
- 12 VDC @ 50 mA or 24 VDC @ 20 mA field selectable power supply
- **Gate Function for rate display of slow pulse rates**
- **Contact De-bounce Filter for counting pulses generated by switch contacts**
- K-Factor, internal or external calibration
- 4-20 mA output option converts the pulse input into an isolated 4-20 mA output

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BASIC METER FUNCTIONS

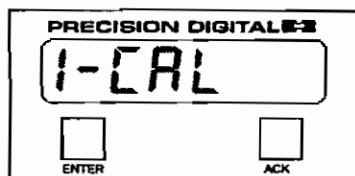
The PD692 & PD693 are six digit universal rate/totalizer/batch controllers used to display flow rate and total; control automatic or manual batching; and provide various higher level functions including programmable root extraction and duplex pump control. The PD692 is an analog input device accepting 4-20mA, 1-5V, 0-5V and 0-10 V field selectable inputs. The PD693 accepts pulse, square wave and 0-5 V or 0-12 V @30 KHz inputs.

Single Button Scaling with One Touch Calibration Bail-out

The PD692 & PD693 are completely programmed using only one button. Press ENTER to start menu scanning; then select the menu; then your desired value. Programming ease is now enhanced in the PD692 & PD693 by a one touch calibration bail-out with the use of the ACK (Acknowledge) button.

Stand Alone Scaling (Internal or External)

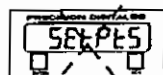
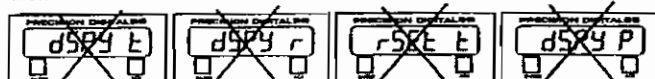
The PD692 & PD693 may be calibrated with or without applying a calibrated signal.



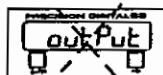
Lockout and Menu-title Disabling

The ability to modify programming values can be restricted by installing a lockout jumper on terminals at the rear of the instrument. In addition, certain menu titles can be programmed not to appear during the menu scroll with the Display menu.

Menu titles that can be excluded with d5PLRY menu functions.

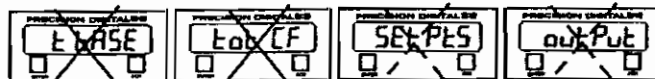


Menu title always appears. Ability to change values may or may not be restricted.



Menu title appears only if the 4-20 mA output option is installed.

Functions that can be locked out with the lockout jumper.



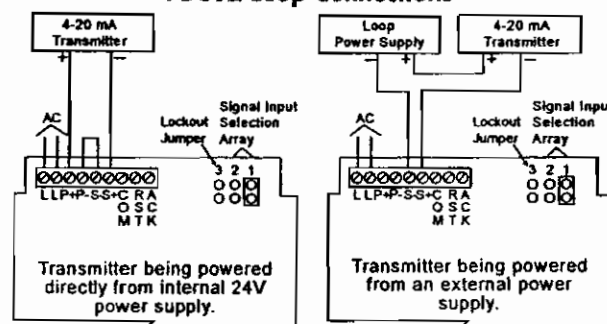
Four Visual Alarms Standard

The PD692 & PD693 have four visual independent alarm points. Each is easily programmed for high or low set point and 100% deadband. Front panel LEDs indicate alarm status and assist in set point/ reset point programming.

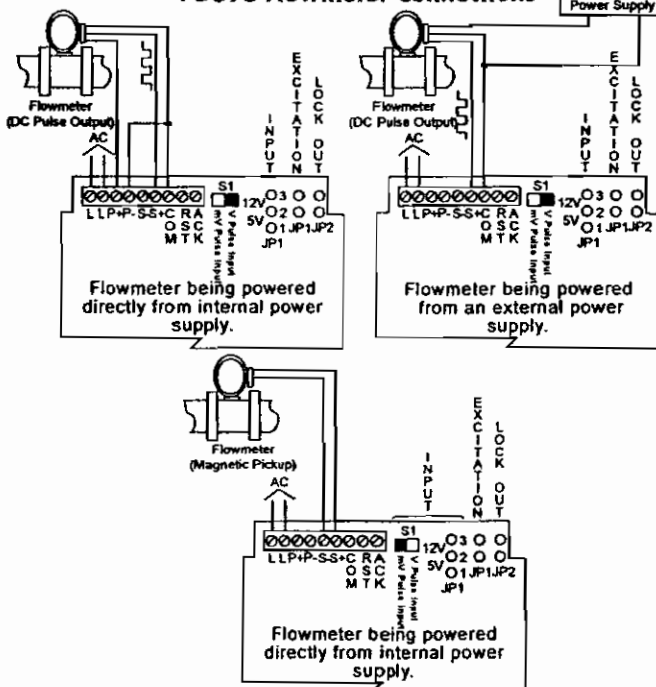
Simplify Loops with Internal Power Supply

The PD692 internal power supply provides 24 VDC at 20 mA to drive either the 4-20 mA input or output loop. The PD693 provides 12 VDC at 50 mA or 24 VDC at 20 mA to power either the flowmeter input or the 4-20 mA output.

PD692 Loop Connections



PD693 Flowmeter Connections



FLOW FEATURES

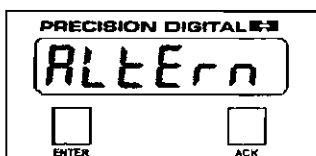
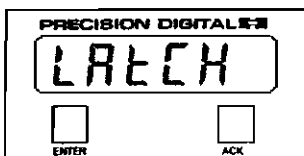
The PD692 & PD693 may be used to display flow rate and total from a wide variety of flowmeters. For flow rate applications, these meters feature programmable time base of seconds, minutes, hours and days, a 4 1/2 digit plus extra zero display, and low-flow cutoff capability. For total applications, these meters feature a full six-digit display, a programmable totalizer conversion factor and the ability to automatically or manually toggle back and forth between a display of rate and total. New features include Programmable Root function for Weirs and Flumes for the PD692 and Gate Function and Contact De-bounce Filter functions for the PD693. In addition, these meters' new full diagnostic menu simplifies programming troubleshooting.

OPTIONS

The PD692 & PD693 can be equipped with 2 or 4 SPDT relays and 4-20 mA output options. Any one of the relays can be programmed to function on the rate or the total. The 4-20 mA output option provides signal isolation and is very useful for converting the pulse output from a flowmeter into a 4-20 mA signal.

Rate Relays

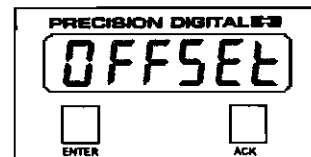
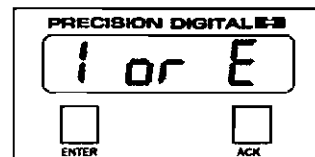
Rate relays are field programmable as latching or non-latching and 0-100% adjustable deadband. They can be used as high or low alarms or for simple on-off control, such as sump-pump control. Pairs of rate relays can also be programmed to alternate making these meters ideal for duplex pumping applications.



Total Relays

Total relays can be programmed for manual (E for External Reset) or automatic (I for Internal Reset) batch control. To simplify and speed up batch-size changes, total relays can be programmed so the first preset always trips at a user-defined offset value before the main preset trips. In addition, the Priority Batch Programming feature allows the user to program the batch presets without having to go through the

entire menu. Simply hold the ENTER button for three seconds and the meter jumps right to batch presets.



4-20 MA OUTPUT OPTION

The PD692 & PD693 can be equipped with an isolated 4-20 mA output signal option that can be programmed to produce a 4-20 mA output signal for virtually any input. The 4-20 mA output signal can be powered either by the internal or an external power supply. If the internal power supply is used, it is not available to power the transmitter input. The 4-20 mA output provides 500 VDC or peak AC, input-to-output, or input/output-to-power isolation.

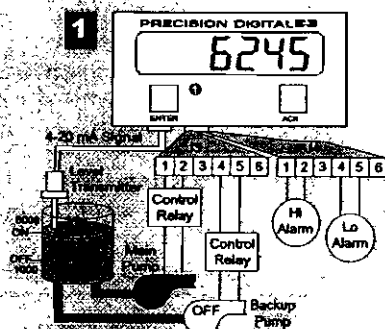
Option Card Pinouts

Notes:

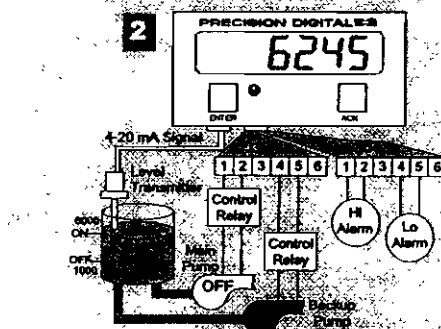
1. Alarm acknowledgement terminals (ACK and COM) are located on the meter main board.
2. In the alarm condition, the NC contact is connected to common in the fail safe mode.

Pin:	Function:	
J1 1	Transmitter +	PD175
2	Transmitter -	
J2 1	Relay #1 Common	PD176
2	Relay #1 NC	
3	Relay #1 NO	PD174
4	Relay #2 Common	
5	Relay #2 NC	PD177
6	Relay #2 NO	
J3 1	Relay #3 Common	PD178
2	Relay #3 NC	
3	Relay #3 NO	PD177
4	Relay #4 Common	
5	Relay #4 NC	PD178
6	Relay #4 NO	

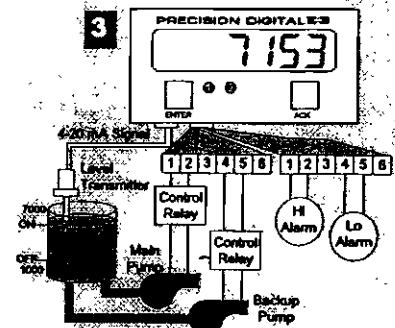
PUMP ALTERNATION



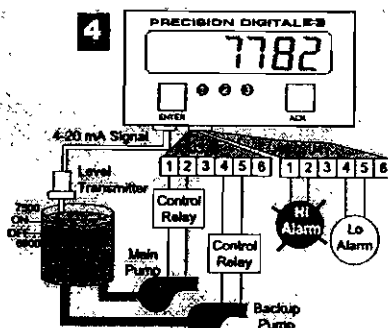
Relay #1 turns the main pump on at 6000 gallons and turns it off at 1000 gallons.



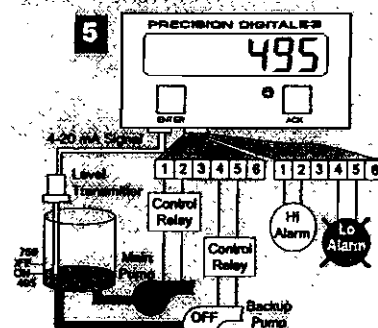
With the Pump Alternation feature activated, the next time the level reaches 6000 gallons, relay #2 transfers and starts the backup pump.



The backup pump is not able to keep up, so when the level reaches 7000 gallons, relay #1 transfers and starts the main pump.

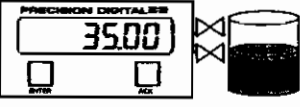
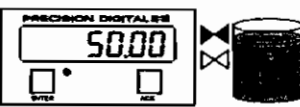
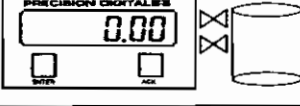


Relay #3 trips the High Level Alarm at 7500 gallons and resets at 6900 gallons.

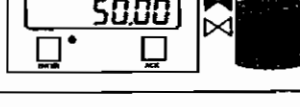
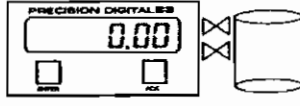
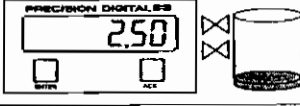


Relay #4 trips the Low Level Alarm at 495 gallons and resets at 750 gallons.

AUTOMATIC BATCH CONTROL OPERATION

The valve KEY Legend is as shown:	KEY  = VALVE CLOSED  = VALVE OPEN
Both valves are open to fill the barrel. The top valve is the full flow-valve, the bottom valve the restricted-flow valve. The meter displays the barrel's content.	
Full-flow valve #1 is closed and restricted-flow valve #2 "dribbles" in the remaining 5 gallons.	
When the total reaches 55.00 gallons, relay 2 trips and the restricted-flow valve #2 closes. This automatically causes the total to reset to zero.	
The full barrel is removed and a new barrel inserted. The valves are still closed, the two relays are still in the tripped condition.	
After the programmed delay has elapsed, the two relays will reset and the two valves will open.	
The barrel will now begin to fill.	

MANUAL BATCH CONTROL OPERATION

The valve and External Switch KEY Legend is as shown:	KEY  = VALVE CLOSED  = VALVE OPEN  = External RESET Switch Pressed
Both valves are open to fill the barrel: Meter displays barrel contents.	
Full-flow valve #1 is closed and restricted-flow valve #2 "dribbles" in the remaining 5 gallons.	
When the total reaches 55.00, relay 2 trips and closes restricted-flow valve #2. Display freezes on 55.00 and relays 1 and 2 will not reset until external switch is pushed.	
Both valves are still closed and a new barrel is positioned. Meter displays previous barrel's contents until external reset button is pushed.	
Operator presses reset switch to reset total. Total goes to zero. Both relays reset causing both valves to open and begin filling the new barrel.	
Both valves are open to fill the barrel: Meter displays barrel contents.	

SPECIFICATIONS

Except where noted all specifications apply to operation at +25°C.

PD692 & PD693 BASIC METERS
INPUTS:

PD692 Field selectable:

4-20 mA, 0-20 mA, 0-5 V, 1-5 V, 0-10 V

PD693 Field Selectable:

Pulse or Square Wave 0-5 V or 0-12 V @ 30 kHz; TTL; Open Collector 4.7 K Ω pull-up to 12 V @ 30 kHz; Switch Contact 4.7 K Ω pull-up to 12 V @ 40 Hz.

DISPLAY: Six digit, 0.56" (14.2 mm) high efficiency red or green seven segment LED. Rate: -19,999(0) to 29,999(0) with selectable extra zero Total: 0 to 999,999; automatic lead zero blanking

DECIMAL POINT: Process/rate: 2.9999, 29.999, 299.99, 2999.9, or extra zero may be turned on 299990. Total: 9.99999, 99.9999, 999.999, 9999.99, 99999.9 Rate and total decimal points are independent of each other.

CALIBRATION RANGE:

PD692:

4 mA (1 V) input may be set anywhere in range of the meter. 20 mA (5 V) may be set anywhere in range of the meter above or below 4 mA input. An

Error message will appear if input 1 signal and input 2 signal are too close together.

Input Range	Minimum Difference Between Input 1 & Input 2
0-5 V	0.16 V
0-10 V	0.32 V
4-20 mA	1.60 mA

PD693:

May be calibrated using K-factor scaling, internal calibration or by applying an external calibration signal. Field programmable K-factor converts input pulses to rate in engineering units. May be programmed from 0.0001 to 999,999 pulses/unit

INPUT IMPEDANCE:

PD692: Voltage ranges greater than 300 K Ω ; Current ranges 100 Ω

PD693: Pulse Input greater than 300 K Ω @ 1 kHz

Open Collector/Switch Input 4.7 K Ω pull-up resistor to 12 V

LOOP POWER: (AC units only)

PD692: Isolated power supply, 24 VDC $\pm$ 5% @ 20 mA regulated

Maximum loop resistance is 1200 Ω

PD693: Field selectable, isolated: 12 VDC @ 50 mA for sensor supply or; 24 VDC @ 20 mA regulated $\pm$ 5%. Maximum loop resistance of 1200 Ω

Continued from page 4

LINEAR INPUT ACCURACY:

PD692: $\pm 0.05\%$ of calibrated span ± 1 count

PD693: $\pm 0.1\%$ of full scale

ROOT EXTRACTION ACCURACY: PD692 $\pm 0.1\%$ F.S. ± 2 counts

PROGRAMMABLE EXPONENT: PD692 1.000 to 2.999.

11 POINT LINEARIZATION: PD692

Input Range	Minimum Span Between Inputs
4-20 mA	(1.6 mA / (Number of points - 1))
0-5 V	(0.16 V / (Number of points - 1))
0-10 V	(0.32 V / (Number of points - 1))

e.g. Minimum span for an 11-point, 4-20 mA calibration is 0.16 mA between inputs.

PD693 Minimum span between inputs is 3Hz

CONTACT DE-BOUNCE FILTER: PD693

Filter Setting	Speed Setting	Max Freq (Hz)
2	LO	950
4	LO	450
10	LO	200
25	LO	75
50	LO	40
N/A	HI	30,000

GATE FUNCTION: PD693 Slow Pulse rate

Low Gate	High Gate	Min Pulse Rate(p/s)	Min Freq(Hz)
1	3.1	1/3	0.33
1	10.1	1/10	0.01
1	30.1	1/30	0.0333
1	60.1	1/60	0.0167
1	90.1	1/90	0.0111
1	99.1	1/99	0.0101

ALARM POINTS: Four, any combination of high or low alarms

ALARM POINT DEADBAND: 0-100% of full scale, user selectable

ALARM STATUS INDICATION: Front panel LED

PEAK HOLD (DISPLAY PEAK): Captures the peak process/rate and displays it via the front panel ENTER button (dSPY P)

PEAK HOLD INDICATION: Front panel flashing R LED

LOCKOUT:

PD692: Jumper J3 restricts modification of calibration values

PD693: Jumper JP2 restricts modification of calibration values

NON-VOLATILE MEMORY: All programming values are stored in non-volatile memory for a minimum of ten years if power is lost.

POWER: AC power, 115 or 230 VAC $\pm 10\%$, 50/60 Hz, 12 VA

DC Power, 18-36 VDC, 6 watts maximum (PD693 DC version not UL Approved)

ISOLATION: AC powered 1500 VAC; DC powered 500 VDC

NORMAL MODE REJECTION: 64 dB at 60 Hz.

ENCLOSURE: 1/8 DIN, high impact plastic, UL 94V-0

FRONT PANEL: Type 4X, NEMA 4X, Panel gasket provided

ENVIRONMENTAL:

Operational Ambient Temperature Range: 0° to +60°C

Storage temperature range: -40° to +85°C

Relative humidity: 0 to 90% non-condensing

CONNECTIONS: Removable screw terminal blocks, accept 22 to 12 AWG wire

MOUNTING: 1/8 DIN panel cutout required. Two panel mounting brackets provided

OVERALL DIMENSIONS: 2.30 x 4.25 x 5.30 in. (58 x 108 x 135 mm)

WEIGHT: Approximately 16 oz (454 g); basic model, no options

WARRANTY: 1 year parts and labor

EXTENDED WARRANTY: Warranty may be extended an additional 12 months by returning the Product Registration Form within 2 months from date of purchase. See www.predig.com for online registration.

UL FILE NUMBER: E160849; 508 Industrial Control Equipment

PD693 DC powered units are not UL Listed

Rate/Totalizer/Batch Controller Features

RATE DISPLAY INDICATION: LED labeled R on right illuminates when meter is displaying rate or process input

LOW-FLOW CUTOFF: Any input below the low-flow cutoff value will result in a display of zero. May be set from 1 count to 100% F.S., user select-

table. To disable low-flow cutoff, program cutoff value to zero. Totalizer is based on rate display. So, inputs below the low-flow cutoff value will not affect the totalizer. (Low-flow cutoff ignored in PD693 K-factor mode.)

ALTERNATING DISPLAY: Display may be programmed to alternate between rate and total every 10 seconds

TOTAL DISPLAY: 0 to 999,999; automatic lead zero blanking

TOTAL DECIMAL POINT: May be set in any of the following positions: 9.99999, 99.9999, 999.999, 9999.99, or 99999.9 Total decimal point is independent of process/rate decimal point.

TOTALIZER: Calculates total based on rate and field programmable multiplier to display total in engineering units. Time base available in seconds, minutes, hours or days. Time base must be selected according to time units in which rate is displayed

TOTALIZER ROLLOVER: Totalizer rolls over when display exceeds 999,999. Relay status reflects display

TOTALIZER PRESETS: Up to four, user selectable under Setup menu.

Any set point can be assigned to total and may be programmed anywhere in the range of the meter.

PRESET OFFSET: Relays assigned to total can be programmed to trip at any point below the next relay's preset value.

PROGRAMMABLE DELAY ON RELEASE: If the meter is programmed to reset total to zero automatically when the highest preset is reached, then a delay will occur before the total relays reset. This delay can be programmed anywhere between 1 and 999 seconds.

PRIORITY BATCH PROGRAMMING: This feature allows the user to quickly change preset values without going into the main menu by holding the ENTER button for more than 3 seconds.

TOTAL RESET: Via front panel ENTER button, external contact closure, or automatically via user selectable preset value

TOTAL RESET LOCKOUT: Meter may be programmed so total cannot be reset from the front panel

OPTIONS Relays

RATING: 2 or 4 SPDT (form C); rated 2 Amp @ 30 VDC or 2 Amp @ 250 VAC resistive load; 1/14 HP @ 125/250 VAC for inductive loads

ASSIGNED TO PROCESS/RATE OR TOTAL: Any relay may be assigned to process/rate or total.

ELECTRICAL NOISE SUPPRESSION: A suppressor (RC network) to prolong the life of the relays should be connected to each relay contact switching inductive loads. The suppressor provides a degree of protection against electrical noise caused by inductive loads. Recommended suppressor value, 0.01 μ F/470 Ω , 250 VAC

DEADBAND: 0-100% of full scale, user selectable

HIGH OR LOW ALARM: User may program any alarm for a high or low trip point

RELAY OPERATION: Latching or non-latching

FAIL-SAFE OPERATION: Relay coils are energized in non-alarm condition. In case of power failure, relays will go to alarm state. Fail-safe operation may be disabled, by removing jumper J2 located on the Options PCB.

AUTO INITIALIZATION: When power is applied to the meter, relays assigned to total will reflect the state of the accumulated total value in memory. Relays assigned to process/rate will reflect the state of the input to the meter.

RELAYS RESET: User select via JP3 jumper array and Setup menu

Total relays reset

1. When total is reset to zero, if set up for external total reset
2. After delay has elapsed, if set up for internal total reset
3. Manual any time, if set up for external total reset (via user supplied external contact closure at terminals AK and CM or front panel ACK button)

Manual reset resets all manually resettable relays.

Process/rate relays reset

1. Automatic reset only
2. Manual reset only, at any time
3. Automatic plus manual reset at any time
4. Manual reset only after alarm condition has been corrected

Automatic reset: Relays will automatically reset when the input passes the reset point.

Manual reset: It can be performed via user supplied external contact closure at terminals AK and CM or front panel ACK button. Manual reset resets all manually resettable relays.

Continue on page 6

Continued from page 5

Isolated 4-20 mA Transmitter Output

CALIBRATION RANGE: The transmitter output can be calibrated so that a 4 mA output is produced for any process/rate measured by the meter. The 20 mA output may correspond to any process/rate that is at least 501 counts greater or smaller than the process/rate corresponding to 4 mA. (Ex. 4 mA = 0, 20 mA = 501) If the span between 4 and 20 mA is less than 501 counts, an error message will appear.

NO EQUIPMENT NEEDED: The 4-20 mA output from the meter is calibrated without the use of a calibrator.

OUTPUT LOOP-POWER: 24 VDC $\pm$ 5% @ 20 mA, regulated
Maximum loop resistance is 1200 Ω . Output loop is isolated from input loop power.

ACCURACY: $\pm$ 0.1% F.S., $\pm$ 0.004 mA

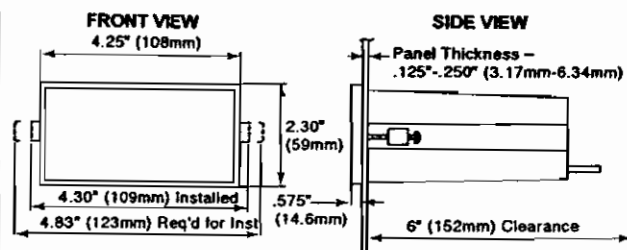
ISOLATION: 500 VDC or peak AC, input-to-output or input/output-to-power line

EXTERNAL LOOP-POWER SUPPLY: 35 VDC max

OUTPUT LOOP RESISTANCE:

Power supply	Min. loop resistance	Max. loop resistance
24 VDC	10 Ω	600 Ω
35 VDC (external)	600 Ω	1000 Ω

Mounting Dimensions



Notes:

1. Panel cutout required: 1.772" X 3.622" (45 mm x 92 mm) 1/8 DIN
2. Panel thickness: 0.125" - 0.250" (3.17 mm - 6.34 mm)
3. Allow 6 inches (152 mm) behind the panel
4. Approximate weight: 16 oz (454g); basic model, no options

ORDERING INFORMATION

PD692 Analog Input

PD693 Frequency/Pulse Input

115 VAC	230 VAC	24 VDC	Description	115 VAC	230 VAC	24 VDC
PD692-3-N	PD692-4-N	PD692-2-N	No Options	PD693-3-N	PD693-4-N	PD693-2-N
PD692-3-14	PD692-4-14	PD692-2-14	2 Relays	PD693-3-14	PD693-4-14	PD693-2-14
PD692-3-15	PD692-4-15	PD692-2-15	4-20 mA Output	PD693-3-15	PD693-4-15	PD693-2-15
PD692-3-16	PD692-4-16	PD692-2-16	2 Relays + 4-20 mA Output	PD693-3-16	PD693-4-16	PD693-2-16
PD692-3-17	PD692-4-17	PD692-2-17	4 Relays	PD693-3-17	PD693-4-17	PD693-2-17
PD692-3-18	PD692-4-18	PD692-2-18	4 Relays + 4-20 mA Output	PD693-3-18	PD693-4-18	PD693-2-18

YOUR LOCAL DISTRIBUTOR IS:

Please visit the Precision Digital website at
www.predig.com

for complete information on the entire line of Precision Digital products, technical information and much more.

Single Door Enclosures

1418 Series

Panel Included

A20

**Panel
Included**


Application

- Designed to house electrical, electronic, hydraulic or pneumatic controls and instruments.
- Provides a degree of protection from falling dirt, dust, oil and water.

Standards

- NEMA Type 12 and 13
- UL 508 Type 12
- CSA Type 12
- JIC EGP-1-1967 except those marked *
- IEC 529, IP65

Construction

- Formed 14 gauge steel bodies and doors.
- Smooth, continuously welded seams without knockouts, cutouts or holes.
- Door and body stiffeners are provided in the larger enclosures for extra rigidity.
- Welded brackets provide for enclosure mounting.
- Formed lip on door and enclosure exclude flowing liquids and contaminants.
- Continuously hinged door may be removed by pulling the hinge pin.
- Door is secured with easily operated plated steel clamps.
- Provision for padlocking.
- Oil resistant gaskets are permanently secured and mechanically retained.
- A removable 12 gauge inner panel is included.
- Collar studs are provided for mounting inner panels.
- A bonding stud is provided on the door and a grounding stud is provided in the enclosure.
- A literature pocket is provided for the inside of the door.

Finish

- Cover and enclosure are phosphatized and finished in ANSI/ASA 61 grey recoatable enamel on the outside, with white enamel on the inside.
- Removable inner panel is finished in white enamel.

Accessories

- Air conditioners K10 - K17
- Blowers K32 - K35
- Breather kits K47
- Door clamping hardware L14
- Door stop kits L2
- Drip shield kits L3
- Enclosure stabilizers L6
- Filter fans K36 - K41
- Floor stand kits L7
- Heaters K45 - K48
- Heat exchangers K20 - K27
- Lock kit L3
- Louvered ventilating plates L16
- Quick release clamp L14
- Spare inner panels L11
- Terminal kit assemblies L13
- Thermostats K47
- Window kits L2

PART NO.	A	B	C	PANEL SIZE D E	MTG. CENTERS F G	SHIP WT. LBS.
1418 A6	12	24	6	9 21	18.0 13.25	34
1418 B6	16	12	6	13 9	9.5 17.25	26
1418 G6	16	16	6	13 13	10.0 17.25	32
1418 CR6	16	20	6	13 17	14.0 17.25	38
1418 CA6	20	12	6	17 9	9.5 21.25	32
1418 C6	20	16	6	17 13	10.0 21.25	38
1418 D6	20	20	6	17 17	14.0 21.25	48
1418 ER6	20	24	6	17 21	18.0 21.25	54
1418 AR6	24	12	6	21 9	9.5 25.25	36
1418 H6	24	16	6	21 13	10.0 25.25	46
1418 E6	24	20	6	21 17	14.0 25.25	54
1418 J6	24	24	6	21 21	18.0 25.25	62
1418 FG6	30	16	6	27 13	10.0 31.25	56
1418 F6	30	20	6	27 17	14.0 31.25	66
1418 K6	30	24	6	27 21	18.0 31.25	76
1418 L6	36	24	6	33 21	18.0 37.25	91
1418 M6	36	30	6	33 27	24.0 37.25	114
1418 A8	12	24	8	9 21	18.0 13.25	38
1418 B8	16	12	8	13 9	9.5 17.25	28
1418 G8	16	16	8	13 13	10.0 17.25	34
1418 CR8	16	20	8	13 17	14.0 17.25	43
1418 CA8	20	12	8	17 9	9.5 21.25	35
1418 C8	20	16	8	17 13	10.0 21.25	40

PART NO.	A	B	C	PANEL SIZE D E	MTG. CENTERS F G	SHIP WT. LBS.
1418 D8	20	20	8	17 17	14.0 21.25	48
1418 ER8	20	24	8	17 21	18.0 21.25	61
1418 AR8	24	12	8	21 9	9.5 25.25	40
1418 H8	24	16	8	21 13	10.0 25.25	50
1418 E8	24	20	8	21 17	14.0 25.25	58
1418 J8	24	24	8	21 21	18.0 25.25	68
1418 KR8	24	30	8	21 27	24.0 25.25	82
1418 KA8	30	12	8	27 9	9.5 31.25	50
1418 KG8	30	16	8	27 13	10.0 31.25	60
1418 F8	30	20	8	27 17	14.0 31.25	70
1418 K8	30	24	8	27 21	18.0 31.25	82
1418 KK8	30	30	8	27 27	24.0 31.25	102
1418 MR8	30	36	8	27 33	30.0 31.25	124
1418 L8	36	24	8	33 21	18.0 37.25	96
1418 M8	36	30	8	33 27	24.0 37.25	120
1418 LL8*	36	36	8	33 33	30.0 37.25	142
1418 N8	42	24	8	39 21	18.0 43.25	110
1418 O8*	42	30	8	39 27	24.0 43.25	132
1418 P8*	42	36	8	39 33	30.0 43.25	182
1418 Q8	48	24	8	45 21	18.0 49.25	122
1418 R8*	48	30	8	45 27	24.0 49.25	173
1418 S8*	48	36	8	45 33	30.0 49.25	201
1418 T8*	60	36	8	57 33	30.0 61.25	246

* Does not meet JIC requirements

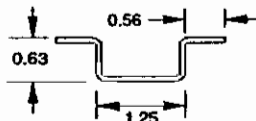
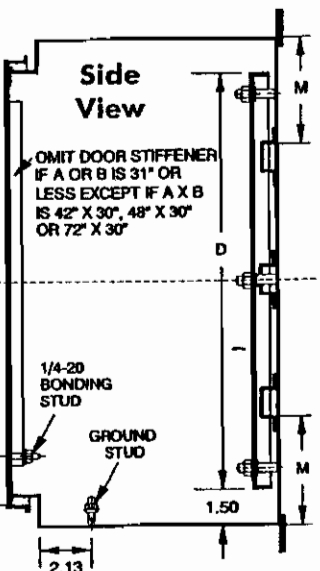
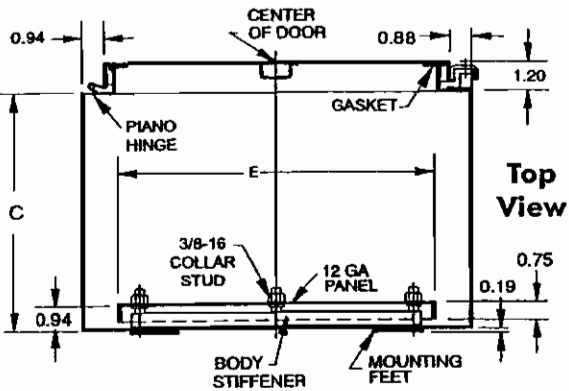
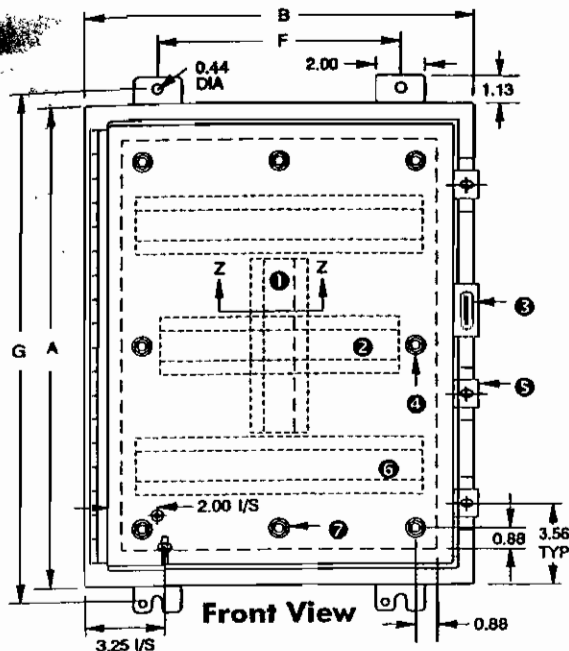
□ Flat Panel

All dimensions in inches unless specified otherwise

Single Door Enclosures

1418 Series

Panel Included



Section Z-Z

WHEN A=	M=
30	7.00
36	9.00
42	9.88
48	11.38
60	14.38
72	17.38

- ① Vertical stiffener required on KK, M, MR and LL only.
- ② Omit center stiffener if A is less than 41".
- ③ Padlocking hasp and staple
- ④ Omit 2 middle studs if A is less than 31".
- ⑤ Omit if A is less than 48".
- ⑥ Omit stiffeners where A or B is 28" or less.
- ⑦ Omit 2 middle studs if B is less than 31".

PART No.	A	B	C	D	E	F	MTG. CENTERS	SHIP
							G	WT. LBS.
1418 B10	16	12	10	13	9	9.5	17.25	30
1418 C10	20	16	10	17	13	10.0	21.25	44
1418 D10	20	20	10	17	17	14.0	21.25	52
1418 AR10	24	12	10	21	9	9.5	25.25	42
1418 E10	24	20	10	21	17	14.0	25.25	64
1418 J10	24	24	10	21	21	18.0	25.25	73
1418 F10	30	20	10	27	17	14.0	31.25	76
1418 K10	30	24	10	27	21	18.0	31.25	86
1418 L10	36	24	10	33	21	18.0	37.25	105
1418 M10	36	30	10	33	27	24.0	37.25	124
1418 O10	42	30	10	39	27	24.0	43.25	140
1418 P10	42	36	10	39	33	30.0	43.25	192
1418 R10	48	30	10	45	27	24.0	49.25	162
1418 S10	48	36	10	45	33	30.0	49.25	208
1418 T10	60	36	10	57	33	30.0	61.25	258
1418 C12	20	16	12	17	13	10.0	21.25	48
1418 E12	24	20	12	21	17	14.0	25.25	68
1418 J12	24	24	12	21	21	18.0	25.25	76
1418 K12	30	24	12	27	21	18.0	31.25	90
1418 KK12	30	30	12	27	27	24.0	31.25	114
1418 L12	36	24	12	33	21	18.0	37.25	108
1418 M12	36	30	12	33	27	24.0	37.25	132
1418 LL12	36	36	12	33	33	30.0	37.25	156
1418 O12	42	30	12	39	27	24.0	43.25	150
1418 P12	42	36	12	39	33	30.0	43.25	198
1418 S12	48	36	12	45	33	30.0	49.25	222
1418 T12	60	36	12	57	33	30.0	61.25	264
1418 U12	72	30	12	69	27	24.0	73.25	272
1418 V12	72	36	12	69	33	30.0	73.25	312
1418 E16	24	20	16	21	17	14.0	25.25	74
1418 J16	24	24	16	21	21	18.0	25.25	86
1418 K16	30	24	16	27	21	18.0	31.25	102
1418 M16	36	30	16	33	27	24.0	37.25	140
1418 P16	42	36	16	39	33	30.0	43.25	214
1418 S16	48	36	16	45	33	30.0	49.25	238
1418 T16	60	36	16	57	33	30.0	61.25	290
1418 U16	72	30	16	69	27	24.0	73.25	290
1418 K20	30	24	20	27	21	18.0	31.25	112
1418 M20	36	30	20	33	27	24.0	37.25	152
1418 S20	48	36	20	45	33	30.0	49.25	256
1418 T20	60	36	20	57	33	30.0	61.25	300
1418 U20	72	30	20	69	27	24.0	73.25	308
1418 K24	30	24	24	27	21	18.0	31.25	142
1418 U24	72	30	24	69	27	24.0	73.25	332

* Does not meet JIC requirements

□ Flat Panel

All dimensions in inches unless specified otherwise



Solid State, Intrinsically Safe CONTROLS

17 SPST Isolated Contacts

Designed for use where probes and/or wiring are located in Class I or II, Division 1, Groups A-G hazardous atmospheres. Series 17 sensor circuit is incapable of igniting flammable gases or dust. SPST isolated contacts.

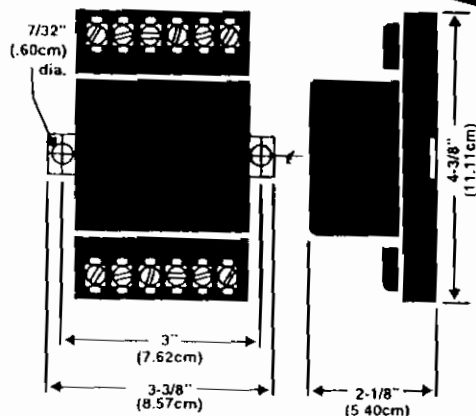
27 SPDT Contacts

Same features and specifications as Series 17, but with SPDT contacts. Series 27 controls are approved for Class III hazardous atmospheres.

37 Class III Hazardous Atmospheres

Same features and specifications as Series 17, but with SPDT contacts and 0-100K ohm-cm sensitivity. Series 37 controls are approved for Class III hazardous atmospheres.

Dimensions Series 17, 27 & 37



Specifications Series 17, 27 & 37

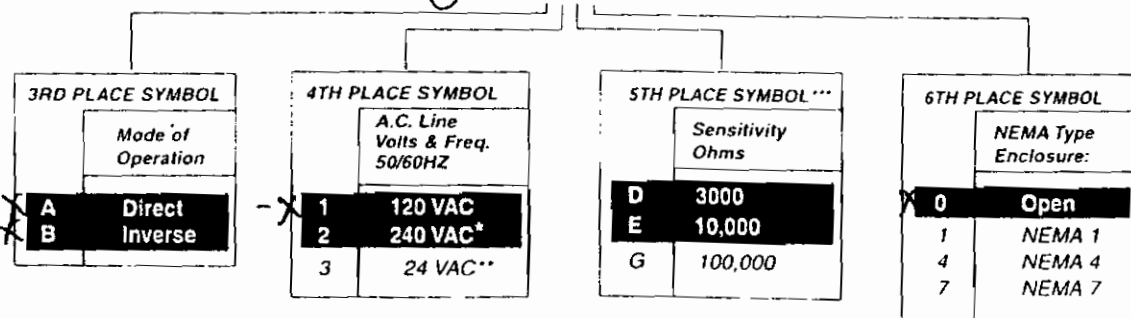
Series	Contact Design	Contact Rating @ 110 VAC	Mode of Operation	Sensitivity	Primary Voltage VAC	Secondary Voltage VAC	Listing	Connections
17	1 N.O. & 1 N.C. Isolated Contacts	8 amp Resistive	Direct/ Inverse factory set	0-470K ohm field adj.	24 115 230	12 3 milliamp current	FM listed	All screw type conn
27	1 N.O. & 1 N.C. (1 form C)	8 amp Resistive	Direct/ Inverse factory set	0-100K ohm factory set	115 230	11 2 3 milliamp current	U.L. listed	All screw type conn.
37	1 N.O. & 1 N.C. (1 form C)	8 amp Resistive	Direct/ Inverse factory set	0-100K ohm factory set	115	11 2 3 milliamp current	CSA listed	All screw type conn

Ordering Information Series 17, 27 & 37

Standard part numbers in bold.

ORDER BY COMPONENT NUMBER

17 27 & 37 XXXX



* 240V standard in Series 17 non-standard but available in Series 27 unavailable in Series 37

** 24V available only in Series 17

*** Series 27/37 only Series 17 includes full set of resistors (3300, 4700, 10 000 22 000, 47 000 100 000 220 000 470 000 ohms) to allow modification of sensitivity in the field Designation for Series 17 5th place symbol is 'X'



Model

- Series 17
- Series 27
- Series 37

Applications

- Hazardous Atmospheres
- Alarms
- Pumps
- Sewage
- Waste Treatment
- CP Industry

Benefits

- Cannot Ignite Flammable Materials
- Solid State Reliability
- Up to 470K Ohm-cm Sensitivity
- Electromechanical Relay
- Rated for Size 3 Mo Service
- Internal Surge Suppression
- SPST Contacts (Series 17)
- SPDT Contacts (Series 27/37)

Description

The complete product line is available in many contact ratings and voltage variations. From 5 Amp to 25 Amps rated contacts and voltage ranges from 6-240 volts for AC or DC operations. Not all voltage ranges are listed. Relays are designed for tab socket or pin socket plug-in bases. Multiple contact configurations; SPDT (single pole double throw), DPDT (double pole double throw), 3PDT (3 pole double throw), or 4PDT (four pole double throw). Some relays have test actuator and LED or mechanical indicator as standard. Relays are UL recognized and CSA certified. Relays are available in single packages or bulk packages at reduced price.

MT Type—The MT type is a 10 Amp rated relay for use with octal plug-in socket. It is available with DPDT or 3PDT contact arrangements. It has test actuator with integral locking tab. Relays are used with MR plug-in pin type sockets for 8 or 11 pin configuration.

RM Type—RM relays are rated at 10 Amps to 25 Amps, and available in DPDT or 3PDT. This type with tab sockets for chassis mount or DIN rail or panel mount using the RM sockets. Some are available with push to test feature.

ZT Type—The ZT type relays are miniature relays with 2 or 4PDT contacts, have mechanical indicator and test actuator with a locking tab. The contacts are rated at 5 Amps, with a voltage range of 6-24V DC and 12-230V AC. It is designed for use with the ZG type plug-in sockets for DIN rail or panel mounting.

KRPA Relays

Type KRPA features multi-contact arrangement, octal plug termination and a clear polycarbonate dust cover. This ruggedly constructed relay is offered with silver-cadmium oxide contacts, code "G" rated 10 amps. Contact arrangements are DPDT or 3PDT forms.

KUP Relays

KUP Relays, rated at 10 amps and feature a square base and .187" quick connect terminals. Available in 2 pole (DPDT) and 3 pole (3PDT) configurations with 10 amp contacts. For use with 27E893 DIN rail socket, they are also available with side flange mounting.

KUMP relays

These relays are similar to the KUP relays with higher Amp ratings of 15 Amp, for DPDT or 3PDT contact configuration.

K10 Miniature Relay

K10 relays offer reliable switching capability in a 15 amp miniature design. These 2 pole (DPDT) relays are supplied with silver cadmium oxide contacts and used with DIN rail socket.

KUHP Relays

A 20 Amp relay with DPDT contacts. Relay designed for bracket mount without a socket.

KUL Latching Relay

KUL Latching Relays with dual coil inputs provide memory, conserve power.

The KUL Magnetic Latching Relay requires approximately half the space needed for mechanical latching relays. All models are silver-cadmium oxide contacts rated 10 amps @ 28V DC, resistive or 240V AC, 80% pf., AC DPDT relays include diodes.

KHAU Relay

Dry circuit up to 5 Amp contacts with 4PDT. Can be mounted on PCB soldered to or socket mounted. It is available with test actuator and Indicator lamp.

KHS Relays

Hermetically sealed for hazardous locations. Contacts are 4PDT with 5 Amp rating. UL recognized for Class 1, Division 2.

RT Relays

Available in 8 Amp DPDT or 16 Amp SPDT contact arrangements. Relays have low profile and sensitive coil designed for printed circuit board mounting.

CK Timing Relays

CK Timers are single range timing relays. They are available in On Delay and Off Delay models with timing ranges from 0.1-180 seconds. All devices have DPDT contact configuration. Bases are 8 Pin for On Delay, 11 Pin for Off Delay.

CNS Timers

The plug-in timers are multifunction timers with up to 8 programmable functions to provide On/Off Delay, Interval and Recycler timing functions.

CNT Timer/Counter

This is a thumbwheel programmable plug in timer with 10 timing modes and 2 counting modes. 10 Amp rated DPDT relay output, and LCD display.

PRD Power Relays

Type PRD is heavy duty power relay designed for high in-rush current applications such as motor starting and incandescent lamp loads.

The PRD relays, silver-cadmium oxide contacts are intended to provide additional contact life and resist welding. These contacts are not recommended for switching low level loads.

Enclosure 35D013 for PRD Relays can be used.

UL and CSA

Style	UL Recognized File Numbers	CSA File Numbers
MT	E38891	LR59548
RM	E38891	LR14385
ZT	E79990	LR5947
KRPA, KUP, KUMP, K10, KUHP, KUL, KHAU, KHS, RT, CK, CNS, CNT, PRD [®]	E29244, E22575, E81558(hermetic)	LR15734 LR15734-123

[®]Models with screw terminals UL Listed others UL Recognized

Plug-in Relay for Tab Socket

KUP11A15120



Plug-in Latching Relay

KUL11A15S24



Plug-in Relay for Pin Socket

KRPA11A624



Power Relay

PRD11AG0120



KRPA/KUP/KUMP

KRPA Relays

Contact Data @ 25°C

Material: Silver-cadmium oxide.

Expected Life: 10 million operations min., mechanical;
100,000 operations min. @ rated loads.

KRPA UL/CSA Contact Ratings @ 25°C		
Contact	Arrangement	Contact Rating
(Silver-Cad. Oxide)	2, 3, Poles	10A @ 240V AC ½ HP @ 240V AC ½ HP @ 120V AC

KRPA Factory Ratings		
Contact	Arrangement	Contact Rating
Silver Cad. Oxide	2, 3 Poles	10A @ 28V DC 120V AC 80% PF 6A @ 250V AC

Coil Data @ 25°C			
KRPA	AC	2VA	Open Models—5VA Enclosed Models—4VA
	DC	1.2W	Open Models—4W Enclosed Models—3W

Duty Cycle: Continuous.

Initial Insulation Resistance: KRPA—1000 Megohms, min.

Coil Data @ 25°C			
	Nominal Voltage	DC Resistance (Ω) ± 10%	Nominal Coil Current (mA)
DC Coils	6	32	188
	12	120	100
	24	472	51
	48	1800	26.6
	110	10,000	11.5
	220	Use 110V relay with 10,000 Ω 5W Resistor in series	
AC Coils	6	6	335
	12	24	168
	24	85	84
	120	2250	17.5
	240	9110	8.75

Operate Data @ 25°C

Must-Operate Voltage:

DC: 75% or less of nominal voltage.

AC: 85% or less of nominal voltage.

Operate Time (Excluding Bounce): 15 milliseconds typical @ nominal voltage.

Release Time (Excluding Bounce): 10 milliseconds typical @ nominal voltage.

Environmental Data

Temperature Range:

Open Models: AC: -45°C to +70°C.

DC: -45°C to +85°C.

Enclosed Models: AC: -45°C to +55°C.

DC: -45°C to +70°C.

Mechanical Data

Enclosed Models: Octal-type plug.

Enclosures: Transparent polycarbonate.

Weight: KRPA 3.0 oz. (85g) approximately.

KUP, KUMP Relays

Contact Data @ 25°C

Materials: Silver-cadmium oxide.

Gold flash available as standard.

Gold diffused and gold alloy on special order.

Expected Mechanical Life:

Contact Ratings			
Material	Arrangement	UL/CSA Ratings	Expected Life
Silver-Cadmium Oxide	2 Pole KUP	10 amps @ 28V DC or 240V AC, 80% PF, 5 amp tungsten @ 120V AC, 3A 600V AC, ½ amp @ 120V DC	100,000
	All KUMP	½ HP @ 120V AC, ½ HP @ 240, 480, and 600V AC, 10 FLA 30 LRA @ 120V AC, 5 FLA, 15 LRA @ 250V AC (FLA ratings covered by 30,000 operations)	
	KUMP	15 amp @ 277V AC, 80% PF, KUMP	100,000
	3 Pole KUP	10 amp @ 28V DC or 120V AC, 80% PF, 6½ amp @ 240V AC, 80% PF	100,000

Initial Dielectric Strength

Between Open Contacts: 1,200V rms.

Between Adjacent Contacts: 2,200V rms.

Between Contacts and Coil: 2,200V rms.

Coil Data @ 25°C

Voltage: 6 to 110V DC and 6 to 240V AC.

Nominal Coil Power:

DC Coils: 1.2 Watts—KUP, KUMP.

AC Coils: 2.0VA—KUP; 2.7VA—KUP, KUMP.

Coil Data				
DC Volts Nominal	1.2 Watt		1.8 Watt	
	DC Ohms ± 10%	Nom. I ma	DC Ohms ± 10%	Nom. I ma
5	21	238	14	360
6	32.1	187	20	300
12	120	100	80	150
24	472	51	320	75
48	1,800	26.7	1,260	38
110	10,000	11	6,720	16
AC Volts Nominal	2 VA		2.7VA	
	DC Ohms ± 15%	Nom. I ma	DC Ohms ± 15%	Nom. I ma
6	6	335	4.2	460
12	24	168	18	230
24	85	84	72	115
120	2,250	17.5	1,700	24
240	9,110	8.75	7,200	12

Operate Data @ 25°C

Must Operate Voltage:

DC Coils: 75% of nominal voltage or less.

AC Coils: 85% of nominal voltage or less.

Operating Time (Excluding Bounce): 15 milliseconds, typical, at nominal voltage.

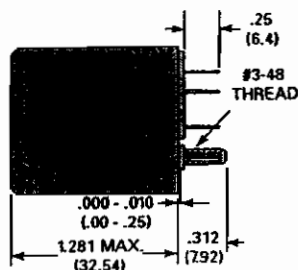
Release Time (Excluding Bounce): 10 milliseconds, typical, at nominal voltage.

Environmental Data

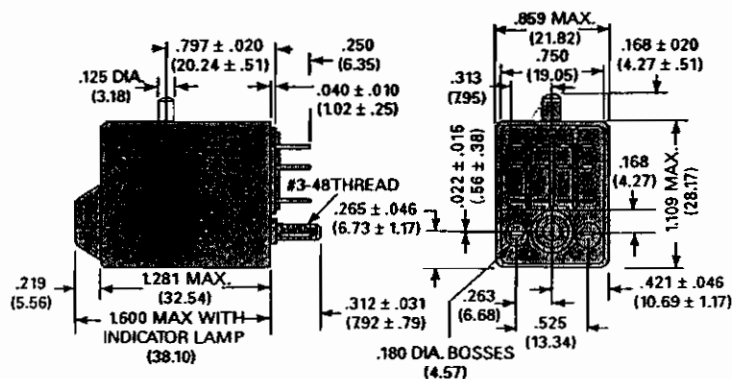
Temperature Range:

Operating: Enclosed Relays: -45°C to max				
Max C°	+45°C	+50°C	+55°C	+70°C
KUP	AC 3-4 pole	DC 4 pole	AC 1-2 pole	DC 1-3 pole
KUMP	AC 3 pole	—	AC 1-2 pole	DC 1-3 pole

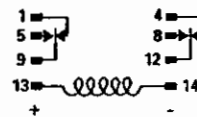
2 & 4 Pole



Neon Indicator, Push-To-Test

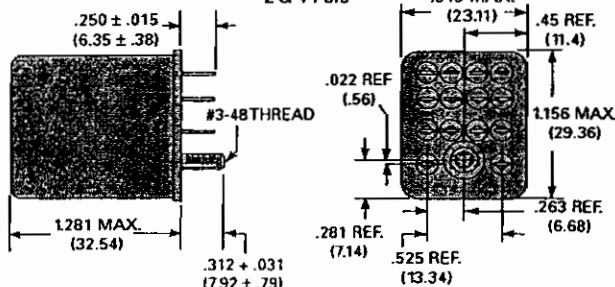


Wiring Diagram (Bottom View) 4 Pole

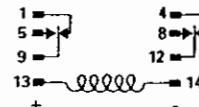


KHS

KHS only
2 & 4 Pole

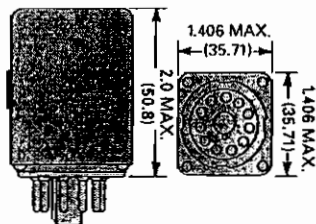


Wiring Diagram (Bottom View) 4 Pole



Class 1 Div. 2 Group A, B, C & D Hazards

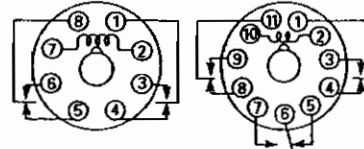
KRPA



Wiring Diagrams (Bottom Views)

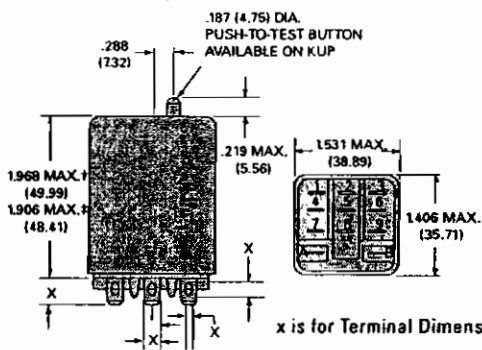
KRPA11

KRPA14

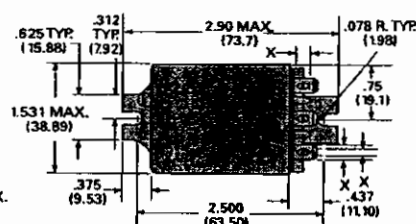


KUP & KUMP

Enclosed Relays Plain Case

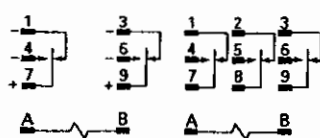


Bracket Mount Case



2 Form C

3 Form C



x is for Terminal Dimensions .187 or .250

Plug-In Relays

Selection

KRPA — 10 Amp General Purpose Relays — Octal Base

KRPA



Features

- Industry Standard Octal Plug-in Base
- Contact arrangement DPDT & 3PDT
- UL recognized and CSA certified
- Contact ratings up to 10 amp 240V AC & 1/2 HP 240V AC
- Mechanical indicator

Ordering Instructions

- Sockets:
27E891—8 Pin
27E892—11 Pin
- Order sockets: see page 631.
- These relays are available with other voltage ratings, contact materials, mounting styles, terminations and contact arrangements. Special request for quotation is required. Minimum quantities may apply.

KRPA—DPDT—8 Pin Octal Base

Voltage	Bulk Package ^①	Bulk Package Qty	Price Each \$	Single Package	Price \$
12V AC	KRPA11AG12	25	17.80	KRPA11AG12S	20.00
12V AC	KRPA11AN12 ^②	25	20.25	KRPA11AN12S ^②	22.75
24V AC	KRPA11AG24	25	17.80	KRPA11AG24S	20.00
24V AC	KRPA11AN24 ^②	25	20.25	KRPA11AN24S ^②	22.75
120V AC	KRPA11AG120	25	17.80	KRPA11AG120S	20.00
120V AC	KRPA11AN120 ^②	25	20.25	KRPA11AN120S ^②	22.75
240V AC	KRPA11AG240	25	18.80	KRPA11AG240S	21.00
240V AC	KRPA11AN240 ^②	25	21.30	KRPA11AN240S ^②	24.00
12V DC	KRPA11DG12	25	17.80	KRPA11DG12S	20.00
12V DC	KRPA11DN12 ^②	25	20.25	KRPA11DN12S ^②	22.75
24V DC	KRPA11DG24	25	17.80	KRPA11DG24S	20.00
24V DC	KRPA11DN24 ^②	25	20.25	KRPA11DN24S ^②	22.75
110V DC	KRPA11DG110	25	19.50	KRPA11DG110S	21.50
110V DC	KRPA11DN110 ^②	25	21.75	KRPA11DN110S ^②	24.50

KRPA—3PDT—11 Pin Octal Base

Voltage	Bulk Package ^①	Bulk Package Qty	Price Each \$	Single Package	Price \$
12V AC	KRPA14AG12	25	22.00	KRPA14AG12S	24.50
24V AC	KRPA14AG24	25	22.00	KRPA14AG24S	24.50
24V AC	KRPA14AN24 ^②	25	24.75	KRPA14AN24S ^②	27.75
120V AC	KRPA14AG120	25	22.00	KRPA14AG120S	24.50
120V AC	KRPA14AN120 ^②	25	24.75	KRPA14AN120S ^②	27.75
240V AC	KRPA14AG240	25	23.00	KRPA14AG240S	25.00
240V AC	KRPA14AN240 ^②	25	26.00	KRPA14AN240S ^②	29.00
12V DC	KRPA14DG12	25	22.00	KRPA14DG12S	24.50
24V DC	KRPA14DG24	25	22.00	KRPA14DG24S	24.50
24V DC	KRPA14DN24 ^②	25	24.50	KRPA14DN24S ^②	27.50
110V DC	KRPA14DG110	25	23.50	KRPA14DG110S	26.25

^①Sold in standard bulk package only, e.g. KRPA11AG12 contains QTY 25 (not individually boxed).

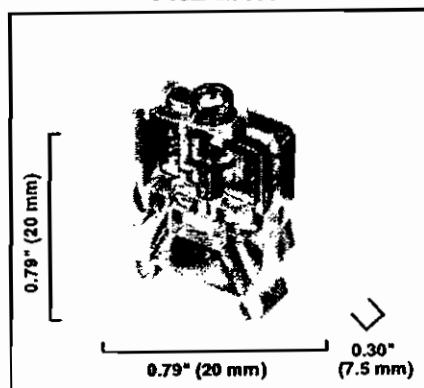
^②With indicator lamp.



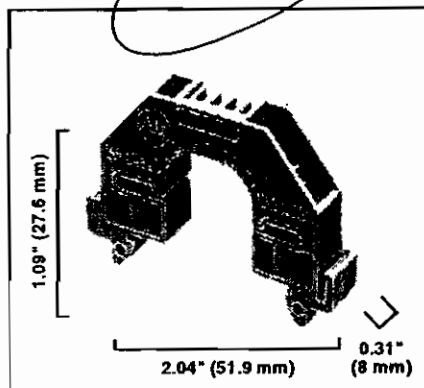
Logic Control

IEC

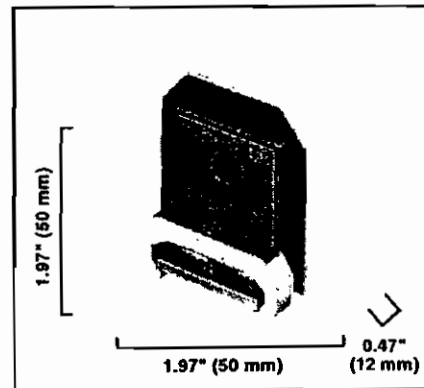
1492-EA15



1492-EA35

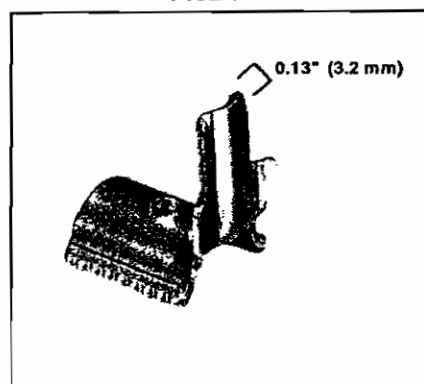


1492-EAH35

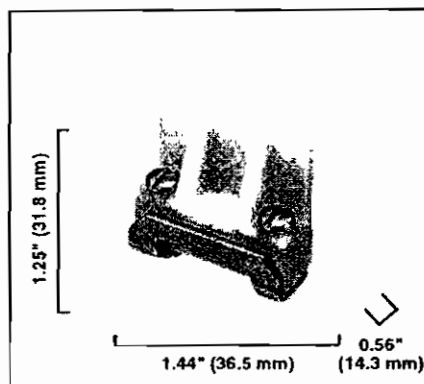


NEMA/EEMAC

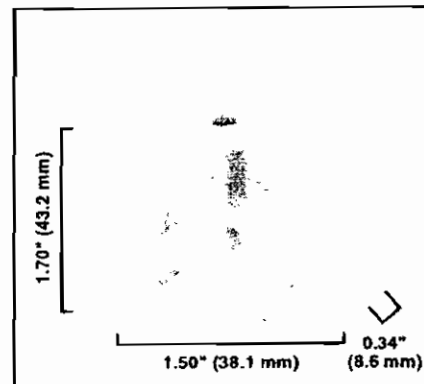
1492-N2



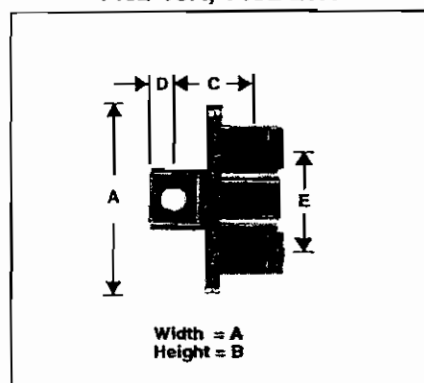
1492-N23



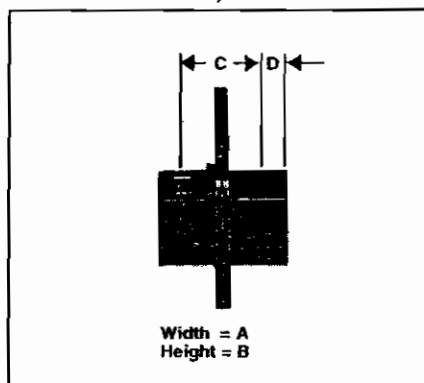
1492-N47



1492-15A, 1492-25A



1492-15E, 1492-25E



Cat. No.	A	B	C	D	E
1492-15A	1.5" (38.1 mm)	1.03" (26.2 mm)	0.594" (15.1 mm)	0.234" (5.9 mm)	0.75" (19.1 mm)
1492-15E	1.5" (38.1 mm)	1.03" (26.2 mm)	0.594" (15.1 mm)	0.234" (5.9 mm)	—
1492-25A	1.88" (47.8 mm)	1.19" (30.2 mm)	0.688" (17.5 mm)	0.203" (5.2 mm)	0.97" (24.6 mm)
1492-25E	1.88" (47.8 mm)	1.19" (30.2 mm)	0.688" (17.5 mm)	0.234" (5.9 mm)	—

30.5 mm Push Buttons

Type 4/13, Watertight/Oiltight

3-Position Selector Switch Units, Non-Illuminated



Standard Knob Operator
Cat. No. 800T-J2A



Knob Lever Operator
Cat. No. 800T-J17A



Metal Wing Lever Operator
Cat. No. 800T-JG11A

Contact Type	Operator Position			Operator Type M = Maintained S = Spring Return	Standard Knob	Knob Lever	Metal Wing Lever
					Cat. No.	Cat. No.	Cat. No.
No Contacts	—	—	—	M M M	800T-J2	800T-J17	800T-JG11
				S→M M	800T-J4	800T-J18	800T-JG15
				M M←S	800T-J5	800T-J19	800T-JG16
				S→M←S	800T-J91	800T-J20	800T-JG141
	O	O	X	M M M	800T-J2A	800T-J17A	800T-JG11A
	X	O	O	S→M M	800T-J4A	800T-J18A	800T-JG15A
				M M←S	800T-J5A	800T-J19A	800T-JG16A
				S→M←S	800T-J91A	800T-J20A	800T-JG141A
	O	O	X	M M M	800T-J2B	800T-J17B	800T-JG11B
	X	O	O	S→M M	800T-J4B	800T-J18B	800T-JG15B
				M M←S	800T-J5B	800T-J19B	800T-JG16B
				S→M←S	800T-J91B	800T-J20B	800T-JG141B

Note: X = Closed/O = Open



3-Position Cylinder Lock Operator
Cat. No. 800T-J41A

Contact Type	Operator Position			Operator Type M = Maintained S = Spring Return	Cylinder Lock		
					Key Removal — Left Ⓚ	Key Removal — Center Ⓚ	Key Removal — All Ⓚ
No Contacts	—	—	—	M M M	800T-J41	800T-J42	800T-J44
				S→M M	—	800T-J50	—
				M M←S	800T-J69	800T-J38	—
				S→M←S	—	800T-J631	—
	O	O	X	M M M	800T-J41A	800T-J42A	800T-J44A
	X	O	O	S→M M	—	800T-J50A	—
				M M←S	800T-J69A	800T-J38A	—
				S→M←S	—	800T-J631A	—

Note: X = Closed/O = Open

Ⓚ Key removable in maintained positions only.

Accessories — Page 10-37

Legend Plates — Page 10-48

Approximate Dimensions — Page 10-51

30.5 mm Push Buttons

Type 4/13, Watertight/Oiltight

Pilot Light Units



Transformer Type Pilot Light
Cat. No. 800T-P16R



Push-to-Test Pilot Light
Cat. No. 800T-PT16R

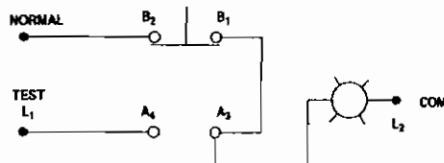
Type	Lamp	Volts	Color	Pilot Light Cat. No.	Push-to-Test ® Cat. No.	Dual Input Cat. No.
Operator Only ®				800T-S00	800T-SB00XX	—
Full Voltage ®	Incandescent	120 AC/DC	Red	800T-Q10R	800T-QT10R	800T-PD16R
			Green	800T-Q10G	800T-QT10G	800T-PD16G
			Amber	800T-Q10A	800T-QT10A	800T-PD16A
		24 AC/DC	Red	800T-Q24R	800T-QT24R	800T-PD24R
			Green	800T-Q24G	800T-QT24G	800T-PD24G
			Amber	800T-Q24A	800T-QT24A	800T-PD24A
	LED	120 AC	Red	800T-QH10R	800T-QTH10R	800T-PDH16R
			Green	800T-QH10G	800T-QTH10G	800T-PDH16G
			Amber	800T-QH10A	800T-QTH10A	800T-PDH16A
		24 AC/DC	Red	800T-QH24R	800T-QTH24R	800T-PDH24R
Green	800T-QH24G		800T-QTH24G	800T-PDH24G		
Amber	800T-QH24A	800T-QTH24A	800T-PDH24A			
No Lamp	0...250 AC/DC	No Lens	800T-QN25	800T-QTN25	—	
Transformer ®	Incandescent	120 AC 50/60 Hz	Red	800T-P16R	800T-PT16R	800T-PDT16R
			Green	800T-P16G	800T-PT16G	800T-PDT16G
			Amber	800T-P16A	800T-PT16A	800T-PDT16A
	LED		Red	800T-PH16R	800T-PTH16R	800T-PDTH16R
			Green	800T-PH16G	800T-PTH16G	800T-PDTH16G
			Amber	800T-PH16A	800T-PTH16A	800T-PDTH16A
No Lamp		No Lens	800T-PN16	800T-PTN16	800T-PDTN16	

- ① Includes one standard 800T-XA (1 N.O. - 1 N.C.) contact block.
- ② Operator only supplied without power module, lamp, lens cap, or contact blocks.
- ③ Dual input full voltage is diode type.
- ④ Dual input transformer is transformer-relay type.

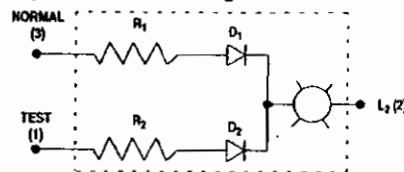
Typical Pilot Light Wiring Diagrams

See applicable Codes and Laws

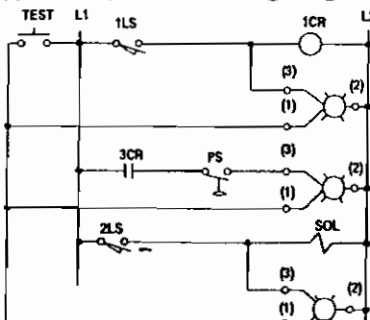
Push-to-Test Pilot Light Device Schematic



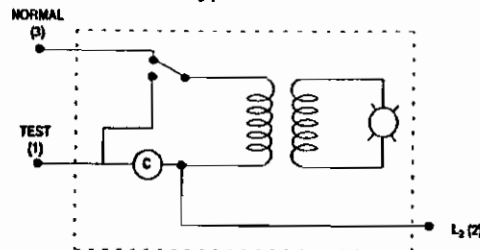
Dual Input Diode Pilot Light Device Schematic



Dual Input Pilot Light Typical Application Wiring Diagram



Dual Input Pilot Light Transformer Type Device Schematic



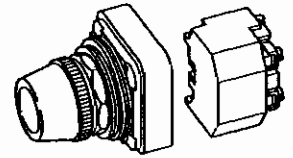
Accessories — Page 10-37
Lamp Information — Page 10-47

Legend Plates — Page 10-48
Approximate Dimensions — Page 10-51

Pilot Light Units

X 800T — P 16 R
a b c d e f

(Pilot Lights)



800T — Q T 24 G AR
a b c d e f g

(Push-to-Test)

a

Finger-Safe Guards	
Code	Description
Blank	No Guards
C	Guards on Terminals

b

Power Module Type	
Code	Description
P	Transformer (or Dual Input)
Q	Full Voltage (or Resistor)
R	Neon

c

Lamp Test Options	
Code	Description
Blank	No Test Option
T	Push-to-Test
D	Dual Input — Diode
DT	Dual Input — Transformer Relay
Note: Push-to-Test Pilot Light is supplied with a factory jumpered 800T-XA, 1 N.O.-1 N.C. Contact Block.	

d

Illumination Options	
Transformer	
Code	Description
Blank	Incandescent
F	Flashing Incandescent
H	LED
Full Voltage	
Code	Description
Blank	Incandescent
F	Flashing Incandescent
H	LED
Resistor	
Code	Description
Blank	No Options
Neon	
Code	Description
Blank	No Options
Dual Input	
Code	Description
Blank	Incandescent
H	LED

e

Voltage	
Transformer	
Code	Description
36	48V AC 50/60 Hz
16	120V AC 50/60 Hz
26	240V AC 50/60 Hz
78	277V AC 50/60 Hz
46	480V AC 50/60 Hz
56	600V AC 50/60 Hz
Full Voltage	
Code	Description
06	6V AC/DC
12	12V AC/DC
24	24V AC/DC
32	32V AC/DC
48	48V AC/DC
10	120V AC/DC
13	130V AC/DC
20	240V AC/DC
Resistor	
Code	Description
11	120V AC/DC Resistor
Neon	
Code	Description
10	120V AC/DC
20	240V AC/DC
Dual Input	
Code	Description
16	120V AC
24	24V AC/DC

f

Lens Color	
Plastic	
Code	Color
Blank	No Lens
A	Amber
B	Blue
C	Clear
G	Green
R	Red
W	White
Glass	
Code	Color
D	Amber
E	Blue
F	Clear
H	Green
J	Red
K	White

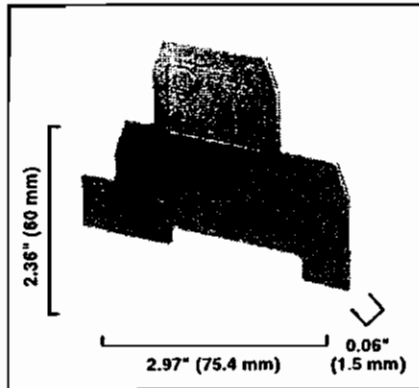
g

Contact Blocks	
Code	Description
Standard	
Blank	1 N.O. - 1 N.C.
Pen TUFF (Low Voltage)	
AV	1 N.O. - 1 N.C.
Class 1, Div. 2/Zone 2	
Logic Reed	
AR	1 N.O. - 1 N.C.
Sealed Switch	
AP	1 N.O. - 1 N.C.
Stackable Sealed Switch	
AY	1 N.O. - 1 N.C.

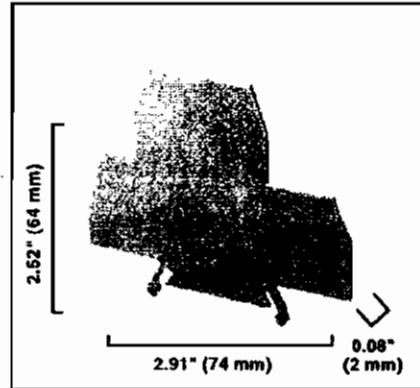
- ① Neon is only available in amber or clear.
- ② Diode type dual input provides circuit isolation via opposing diodes. Not recommended for use with solid-state outputs and neon indicators.
- ③ Flashing lamps are only available in 6V full voltage units and all transformer units.
- ④ LEDs available in red, green, amber, blue, and white. White LEDs only available in 6V and 24V full voltage and all transformer units. LED color must match lens color, except clear lens supplied with white LED and white lens supplied with amber LED. All LEDs except 120V have an internal shunt resistor for use with solid-state outputs.
- ⑤ 32V and 130V are LED only. 240V is incandescent only.
- ⑥ 120V LED is AC only and does not contain internal shunt resistor. For AC/DC and internal shunt resistor, order 130V AC/DC LED (Code 13).
- ⑦ Dual input diode only.
- ⑧ Glass lens available on pilot lights only. Not available on push-to-test units.
- ⑨ Push-to-test units only.

IEC, Continued

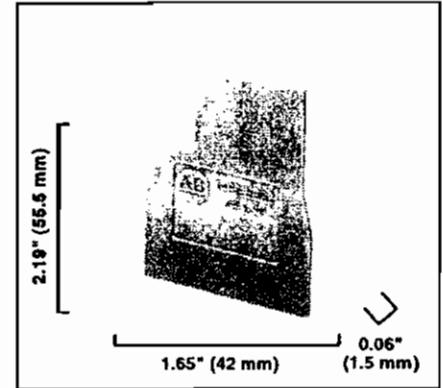
1492-EBD4P



1492-EBD6

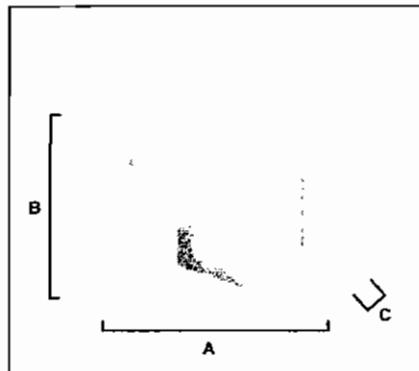


1492-EBR3

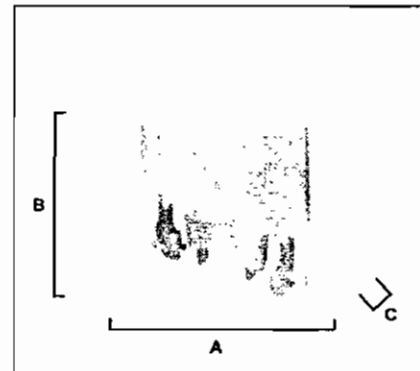


NEMA/EEMAC

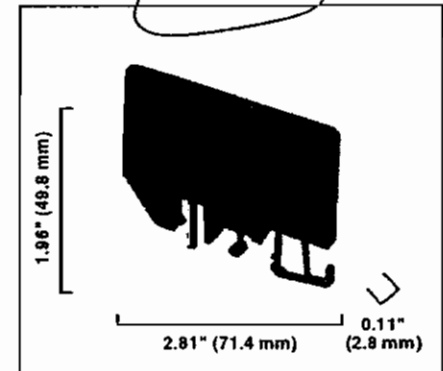
1492-NM16, 1492-NM16BL,
1492-NM16GL, 1492-NM36



1492-N16, 1492-N17,
1492-N18, 1492-N36



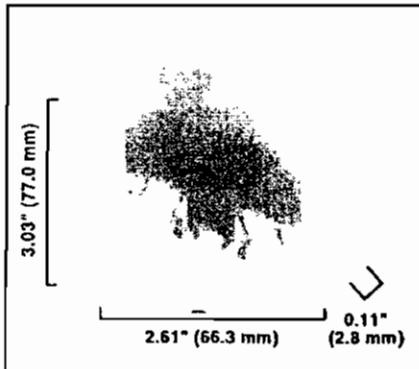
1492-N37



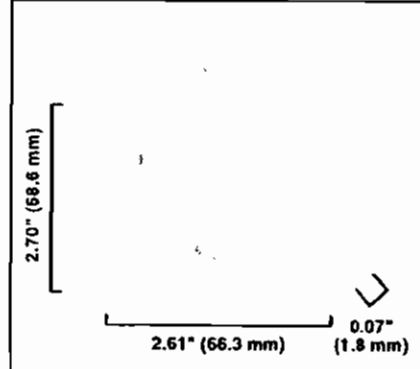
Cat. No.	A	B	C
1492-NM16	1.50" (38.1 mm)	1.39" (35.3 mm)	0.07" (1.78 mm)
1492-NM16BL	1.50" (38.1 mm)	1.39" (35.3 mm)	0.07" (1.78 mm)
1492-NM16GL	1.50" (38.1 mm)	1.39" (35.3 mm)	0.07" (1.78 mm)
1492-NM36	1.56" (39.6 mm)	1.45" (36.8 mm)	0.07" (1.78 mm)

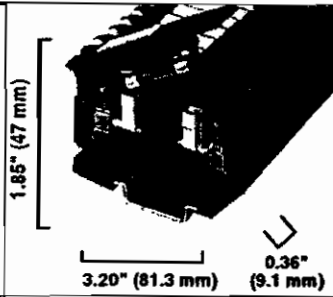
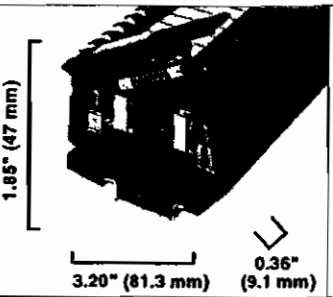
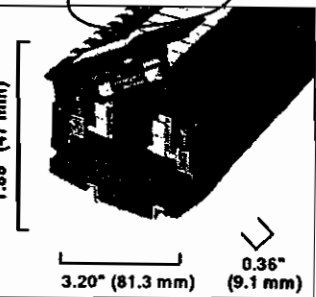
Cat. No.	A	B	C
1492-N16	1.50" (38.1 mm)	1.78" (45.2 mm)	0.11" (2.8 mm)
1492-N17	1.75" (44.5 mm)	2" (50.8 mm)	0.14" (3.6 mm)
1492-N18	1.25" (31.8 mm)	1.13" (28.7 mm)	0.11" (2.8 mm)
1492-N36	1.56" (39.6 mm)	1.68" (42.5 mm)	0.11" (2.8 mm)

1492-N40



1492-NM40



	1492-H4			1492-H5			1492-H6		
Dimensions are not intended to be used for manufacturing purposes. Note: Height dimension is measured from top of rail to top of terminal block.									
Specifications	Single-circuit fusible terminal block with neon blown fuse indicator.			Single-circuit fusible terminal block with LED blown fuse indicator.			Single-circuit fusible terminal block without a blown fuse indicator.		
Approvals		CSA	IEC		CSA	IEC		CSA	IEC
Voltage Rating	300V AC/DC	300V AC/DC	500V AC/DC	300V AC/DC	300V AC/DC	500V AC/DC	300V AC/DC	300V AC/DC	500V AC/DC
Maximum Current	12 A	12 A	12 A	12 A	12 A	12 A	12 A	12 A	12 A
Wire Range (Rated Cross Section)	#30... #12 AWG	#30... #12 AWG	0.05... 4 mm ²	#30... #12 AWG	#30... #12 AWG	0.05... 4 mm ²	#30... #12 AWG	#30... #12 AWG	0.05... 4 mm ²
Indicator Type	Neon			LED			Non-Indicating		
Leakage Current	2 mA @ 300V			2 mA @ 24V			—		
Working Voltage	100...300V AC			10...57V AC/DC			Per Fuse Rating		
Fuse Size (Not Supplied)	1/4" x 1-1/4"			1/4" x 1-1/4"			1/4" x 1-1/4"		
Wire Strip Length	0.38" (9.7 mm)			0.38" (9.7 mm)			0.38" (9.7 mm)		
Recommended Tightening Torque	3...7 lb-in. (0.3...0.8 Nm)			3...7 lb-in. (0.3...0.8 Nm)			3...7 lb-in. (0.3...0.8 Nm)		
Density	33 pcs./ft (109/m)			33 pcs./ft (109/m)			33 pcs./ft (109/m)		
Insulation Temperature Range	-40...+221°F (-40...+105°C)			-40...+221°F (-40...+105°C)			-40...+221°F (-40...+105°C)		
Terminal Blocks	Cat. No.	Pcs./ Pkg.		Cat. No.	Pcs./ Pkg.		Cat. No.	Pcs./ Pkg.	
Terminal Block	1492-H4	25		1492-H5	25		1492-H6	25	
Accessories (page 12-172)	Cat. No.	Pcs./ Pkg.		Cat. No.	Pcs./ Pkg.		Cat. No.	Pcs./ Pkg.	
Mounting Rails:									
1 m Symmetrical DIN (Steel)	199-DR1	10		199-DR1	10		199-DR1	10	
1 m Symmetrical DIN (Aluminum)	1492-DR5	10		1492-DR5	10		1492-DR5	10	
1 m Hi-Rise Sym. DIN (Aluminum)	1492-DR6	2		1492-DR6	2		1492-DR6	2	
1 m Angled Hi-Rise Sym. DIN (Steel)	1492-DR7	2		1492-DR7	2		1492-DR7	2	
End Barrier	1492-N37	50		1492-N37	50		1492-N37	50	
End Anchors:									
DIN Rail — Normal Duty	1492-EA35	50		1492-EA35	50		1492-EA35	50	
DIN Rail — Heavy Duty	1492-EAH35	10		1492-EAH35	10		1492-EAH35	10	
Jumpers:									
Side Jumper — 10-pole Uninsulated	1492-N49	10		1492-N49	10		1492-N49	10	
Side Jumper — Insulating Sleeve	1492-SJS	10		1492-SJS	10		1492-SJS	10	
Other Accessories:									
Group Marking Carrier	1492-GM35	10		1492-GM35	10		1492-GM35	10	
Marking Systems:									
Snap-in Marker Card	1492-SM8X12	5		1492-SM8X12	5		1492-SM8X12	5	

NEMA/EEMAC Terminal Blocks

Open Construction Blocks, Continued

1492-CAM1

1492-CAM1L

1492-CA2

Dimensions are not intended to be used for manufacturing purposes.

Note: Height dimension is measured from top of rail to top of terminal block.

Specifications

Terminal block, tubular screw with pressure plate, multi-rail mountable.

Terminal block, screw with large head, pressure plate, multi-rail mountable.

Terminal block, tubular screw without pressure plate.

Approvals	UL/CSA	UL/CSA	UL/CSA
Voltage Rating	600V AC/DC	600V AC/DC	600V AC/DC
Maximum Current	55 A	55 A	55 A
Wire Range (Rated Cross Section)	#22...#8 AWG (0.5...10 mm ²)	#22...#8 AWG (0.5...10 mm ²)	#18...#8 AWG (1...10 mm ²)
Wire Strip Length	0.38" (9.7 mm)	0.38" (9.7 mm)	0.38" (9.7 mm)
Recommended Tightening Torque	8...16 lb-in. (0.9...1.8 Nm)	8...16 lb-in. (0.9...1.8 Nm)	10...16 lb-in. (1.1...1.8 Nm)
Density	30 pcs./ft (98/m)	30 pcs./ft (98/m)	30 pcs./ft (98/m)
Insulation Temperature Range	-40...+221°F (-40...+105°C)	-40...+221°F (-40...+105°C)	-40...+221°F (-40...+105°C)

Terminal Blocks

		Cat. No.	Pcs./Pkg.	Cat. No.	Pcs./Pkg.	Cat. No.	Pcs./Pkg.
Color:	White	1492-CAM1	50	1492-CAM1L	50	1492-CA2	50
	Two 3' Rails White	—	—	—	—	1492-CA2175 (88/Rail)	1
	Gold	1492-CAM1GL	50	1492-CAM1LGL	50	1492-CA2GL	50
	Red	1492-CAM1RE	50	1492-CAM1LRE	50	1492-CA2RE	50
	Blue	1492-CAM1B	50	1492-CAM1LB	50	1492-CA2B	50
	Black	1492-CAM1BL	50	1492-CAM1LBL	50	1492-CA2BL	50
	Green	1492-CAM1G	50	1492-CAM1LG	50	1492-CA2G	50
	Yellow	1492-CAM1Y	50	1492-CAM1LY	50	1492-CA2Y	50
	Brown	1492-CAM1BR	50	1492-CAM1LBR	50	1492-CA2BR	50
	Violet	1492-CAM1VT	50	1492-CAM1LVT	50	1492-CA2VT	50
	Gray	1492-CAM1GY	50	1492-CAM1LGY	50	1492-CA2GY	50
	Orange	1492-CAM1OR	50	1492-CAM1LOR	50	1492-CA2OR	50

Accessories (page 12-172)

	Cat. No.	Pcs./Pkg.	Cat. No.	Pcs./Pkg.	Cat. No.	Pcs./Pkg.
Mounting Rails:						
3' Scored A-B Rail	1492-N1	20	1492-N1	20	1492-N1	20
3' Rigid A-B Rail	1492-N22	20	1492-N22	20	1492-N22	20
3' High Rise A-B Rail	—	—	—	—	1492-N44	2
Standoff Brackets (Use Every 12")	1492-N25	2	1492-N25	2	1492-N25	2
1 m Symmetrical DIN	199-DR1	10	199-DR1	10	—	—
1 m Symmetrical DIN (Alumin.)	1492-DR5	10	1492-DR5	10	—	—
1 m Hi-Rise Symmetrical DIN	1492-DR6	2	1492-DR6	2	—	—
1 m Angled Hi-Rise Sym. DIN	1492-DR7	2	1492-DR7	2	—	—
End Barrier	1492-NM16	50	1492-NM16	50	1492-N16	50
End Anchors:						
A-B Rail — Heavy Duty	1492-N23	10	1492-N23	10	1492-N23	10
A-B Rail — Snap On	1492-N47	50	1492-N47	50	1492-N47	50
A-B Rail — Retaining Clip — Light Duty	1492-N2	50	1492-N2	50	1492-N2	50
DIN Rail — Normal Duty	1492-EA35	50	1492-EA35	50	—	—
DIN Rail — Heavy Duty	1492-EAH35	50	1492-EAH35	50	—	—
Jumpers:						
2-pole Uninsulated	1492-N3	50	1492-N3	50	1492-N3	50
50-pole Uninsulated	1492-N30	10	1492-N30	10	1492-N30	10
Fanning Strip: (12-pole can cut to desired length)	1492-N20	1	1492-N20	1	1492-N20	1
Marking Systems	1492-N45	20	1492-N45	20	1492-N45	20

Accessories — Page 12-172

Sensaphone® Express by **Phonetics, Inc.**

is an advanced environmental monitoring system combined with digital speech recording technology for alarm message clarity. *Express* will warn you quickly and automatically with your own voice message when any of the monitored conditions change. *Express* is a comprehensive alarm system that is easy to use and effective to prevent disaster in your remote and unattended facilities.

SPEECH TECHNOLOGY

With *Express*, Phonetics introduces digital speech recording to its family of industrial/environmental monitors. This unique feature of *Express* allows you to record your own voice for the dial-out alarm messages. This means that when *Express* calls you during an alarm, you will receive your personalized voice message telling you exactly what the alarm condition is. Now, you can hear: "The computer room is flooding! Water level has exceeded one inch."

You can record a separate message for each of the four inputs and an ID message. You can record the voice message locally with *Express*'s built-in microphone, or remotely by telephone. The voice messages are stored in non-volatile memory so there is no loss of information if a power failure occurs.

OUTPUT

The output is a SPDT Form C contact capable of switching up to 5 Amps. The output can be automatically controlled when an alarm occurs, or you can call *Express* with a Touch-Tone™ phone and change the output manually.

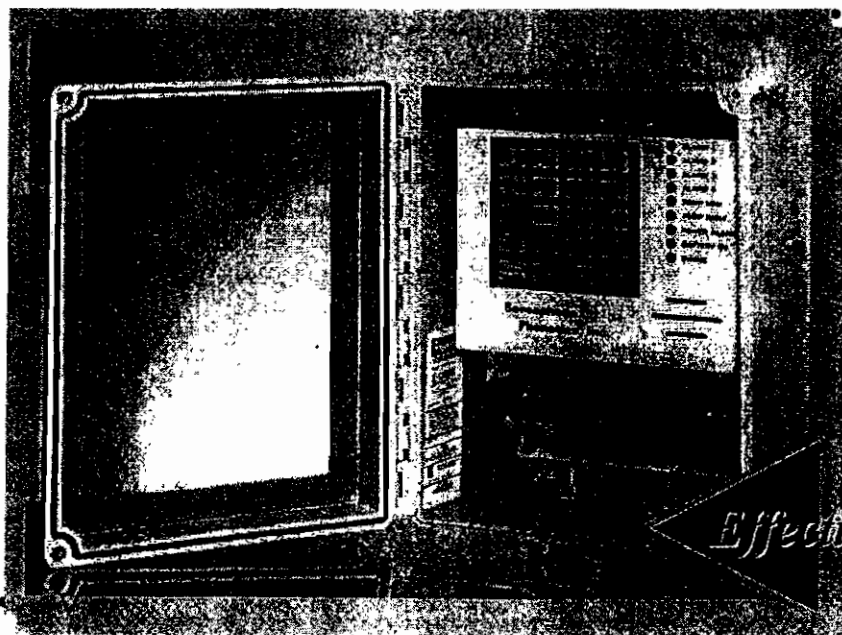
MONITORING CAPACITY

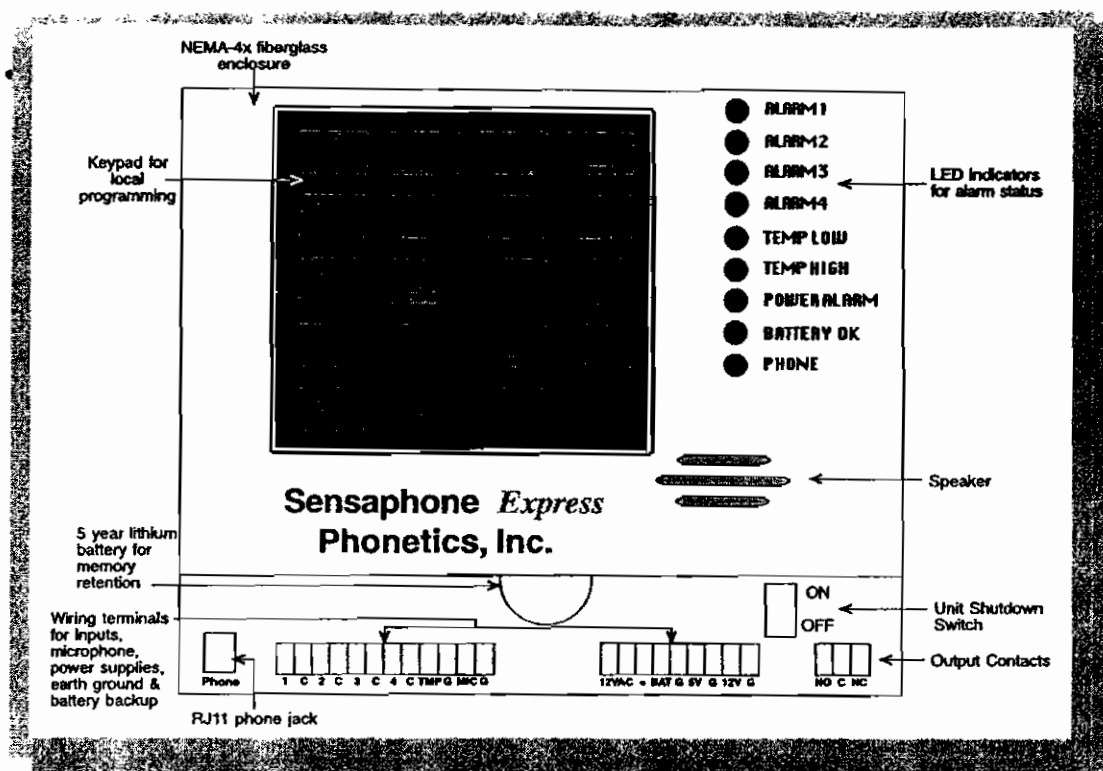
Express monitors up to four dry contacts. These can be configured as either normally open or normally closed. The alarm disabling feature allows you to enable or disable the dial-out for an input during an alarm. *Express* also monitors power failure with its built-in power out detection. Sensaphone® *Express* has a built-in temperature sensor with a 20 ft. cable to monitor in either degrees Fahrenheit or degrees Celsius. Front panel LED's indicate to on-site personnel the status of each input (ALARM/OK) for additional on-site warning. Other LED's indicate the power alarm status, battery condition, and phone status. *Express*'s built-in microphone allows you to call and listen to noises at the remote site.

RELIABILITY

Express is equipped with a 12-hour Gel Cell rechargeable backup battery to ensure continued monitoring through power failures. Microcontroller operation is insured by two watchdog circuits. Dry contact inputs are optically isolated. Non-volatile memory for voice and programming storage also prevents loss.

Express is housed in a high-impact, dust-tight NEMA 4 fiberglass enclosure. Its latched, clear cover allows you to lock the unit for security while still providing easy visual access to the front panel.





Easy access to programming, status information and wiring terminals.

FEATURES

- Digitally records user's voice for ID message and alarm messages for 4 dry contact inputs. Can be recorded locally or remotely
- Monitors 4 dry contact inputs (configured N.O./N.C.), temperature and AC power
- Stores up to 8 32-digit phone numbers
- Front panel LED's indicate input alarm status, power alarm status, low battery condition, and phone status
- 12-hour rechargeable internal battery backup with built-in charger
- Call progress detects busy signal or no answer
- Output relay for automatic or manual switching
- Housed in a dust-tight, high-impact, corrosion-resistant fiberglass NEMA 4 enclosure
- Can share a phone line with other devices
- Non-volatile memory for voice and programming storage
- Ability to call and listen to on-site sounds

PROGRAMMABILITY

Express's voice-guidance makes programming easy. Parameters such as the temperature limits, alarm recognition time, intercall delay, rings until answer, power-out to alarm time, password, message repetitions, phone numbers and voice recording can be easily programmed via the local keypad. Alarm messages can even be changed remotely. A user-defined 4-digit password prevents access to the information. Programming is stored in non-volatile memory to prevent loss of data during power failure or storage.

ALARM NOTIFICATION

When an alarm condition occurs, *Express* automatically dials up to 8 32-digit phone numbers. *Express* recites the user-recorded ID message followed by the recorded alarm message. *Express* monitors call progress to detect busy signals or no answers. These features ensure that the right people get the alarm message without wasted time.

Alarm dial-out stops when *Express* is acknowledged. Alarms can be acknowledged by either pressing Touch-Tones™ on your phone or by calling your *Express* unit back.

Even when there is no alarm situation, you can keep track of your monitored conditions. You can call *Express* from any telephone to obtain a comprehensive status report on all conditions monitored by the system. *Express* also has a built-in microphone so you can listen in to sounds at the site. You can also review and change alarm messages.

affordable monitoring, 24 hours a day.

APPLICATIONS



For monitoring of remote or unattended locations, Sensaphone® *Express* is ideal. Typical applications for *Express* include:

- Boilers
- Chemical Plants & Refineries
- Computer Rooms & Peripherals
- Electric Power Substations
- Frozen Food Storage
- Greenhouses
- Hatcheries, Fish & Poultry
- HVAC Systems & Equipment
- Pipelines & Compressor Stations
- Remote Pump Stations
- Security
- Switchgear & Telephone Huts
- Water & Waste Treatment Plants

SPECIFICATIONS



General:

Monitoring Capacity:	4 dry contact inputs (configured Normally Open or Normally Closed)
	Power failure
	Temperature: -60° to 175° F or -50° to 80° C
Speech Technology:	ADPCM 24 kb/s
Message Length:	8 seconds for alarms / 10.5 seconds for ID
Message Types:	4 alarm messages / 1 ID message
Telephone Numbers:	8 phone numbers, up to 32 digits
Dialing Format:	Touch-Tone™ or pulse
Phone Connector:	RJ11C
Output Type:	SPDT Form C 5A 125 VAC

Electrical:

Power Requirements:	120 VAC 10 Watts Max
Internal Battery Backup:	12 hour Gel Cell with built-in charger

Environmental:

Operating Temperatures:	32° - 120° F
Operating Humidity:	0 - 90%, non-condensing
Storage Temperatures:	10° - 130° F

Physical:

Dimensions:	10.5" x 8.5" x 6.25"
Weight:	9 lbs. 4 oz.
Enclosure:	NEMA 4
Construction:	High-impact, fiberglass with hinged, latched clear cover

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Touch-Tone™ trademark of AT&T. Specifications subject to change without notice.

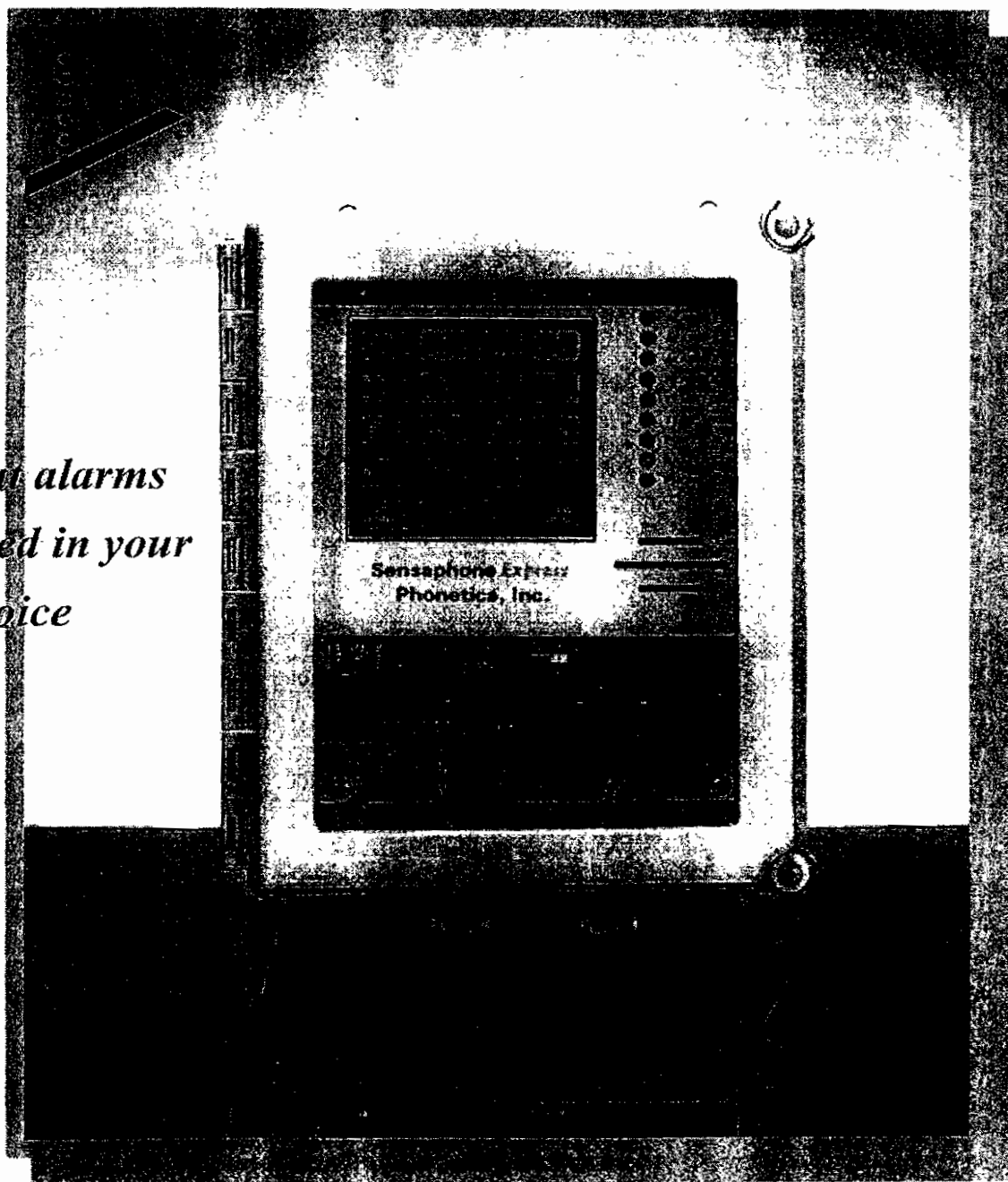


Phonetics, Inc.

901 Tryens Road Aston, PA 19014 Phone: (610)558-2700 FAX: (610)558-0222 <http://www.sensaphone.com>

Sensaphone[®] Express.....

*Dialout alarms
expressed in your
voice*



Phonetics, Inc.

901 Tryens Road Aston, PA 19014 Phone: (610)558-2700 FAX: (610)558-0222

ENGINEERING SPECIFICATIONS

SENSAPHONE® EXPRESS

I. General

The Automatic dialer shall be a self-contained microprocessor controlled system capable of monitoring up to 4 alarm channels, temperature and AC power. The system shall be configured for operation by the user by means of the built-in keypad. The system shall allow limited access to programming remotely by touch-tone telephone. The system shall have one on-board output. Characteristics of Input and Output channels include Dry Contact Input and Digital Relay Output.

Upon detection of any alarm or status change, the system shall commence dialing telephone numbers and deliver a voice message identifying and describing the alarm condition(s). The alarm message shall be delivered in digitized human voice using messages recorded by the user. The system will continue to call telephone numbers in succession until a positive acknowledgment of the alarm message is received. Acknowledgment is accomplished by depressing tone keys from the called telephone, or by calling the system back within a programmed time period. The alarm may also be acknowledged using the local keypad. In addition, the system shall be able to receive incoming telephone calls. Upon answering, the system shall recite a status report and allow access to remote operation and programming.

The system shall be FCC and DOC registered for direct connection to the telephone network. The system shall have a one year warranty from the manufacturer. The system shall be a Sensaphone® Express by Phonetics, Inc.

II. I/O Channel Attributes and Features

A. Inputs

The system shall come standard with 4 dry contact input channels, configurable as NO or NC digital dry contact using 2mA loop current.

The system shall have the following built-in monitoring features:

1. AC power failure detection
2. Temperature with pre-wired 2.8K thermistor (-60°F to 175° F)

All monitored channels, including built-in monitoring features, shall allow local keypad programming of pertinent operational data including, but not limited to:

1. Input type (NO/NC)
2. High and Low limits (temperature)
3. Input recognition time (0 seconds to 272 minutes)
4. Enable/disable for each channel to dialout for alarm

B. Output

The system shall have one built-in SPDT form C 5A 125VAC relay output. The output may be programmed to switch automatically or manually.

III. Communications Features

A. Telephone Specifications

The system shall connect to a standard 2-wire telephone line using pulse or tone, with loop start only. The system shall recognize ringer frequencies from 16 to 60 Hz. No leased or dedicated lines shall be required. The system shall also be capable of being used on the same telephone line as other answering devices. Call progress detection shall ensure that the alarm dialout is not hindered by no answers or busy signals.

B. Telephone Numbers

The system shall be capable of dialing up to 8 telephone numbers, 32 digits each. The system shall allow local keypad programming of the following telephone dialing information:

1. Dialing method (Pulse or tone)
2. Message repetitions (0 to 255)
3. Maximum number of calls (0 to 255)
4. Call delay time (0 seconds to 255 seconds)
5. Intercall delay time (0 seconds to 272 minutes)
6. Redial on busy (enable/disable)

C. Voice Messages

The System shall have the ability to record, store and reproduce voice messages and to use those messages to articulate the location and status of the monitored channels. In absence of user-recorded voice messages, the system shall articulate channel status using the internally resident vocabulary. All digitized speech message data shall be stored in nonvolatile memory with a 3V lithium battery backup. Such battery backup shall be capable of protecting speech memory for at least 2 years of complete power outage.

There shall be one recorded identification message for the system, and one recorded alarm message for each input channel. Message length shall be 8 seconds per input channel and 10.5 seconds for the identification message.

D. Beeper/Pager Dialout

The system shall be capable of intelligently dialing out to a numeric beeper or pager. The dialing sequence shall be programmable such that the pager number is dialed, the system waits for the telephone to be answered, and then additional identification DTMF digits are transmitted.

E. Line Seizure Feature

The system automatically seizes control of the phone line to make an alarm phone call when the alarm occurs. All other calls, including current calls, will disconnect and all extensions will be disabled. Extensions will remain cut off until the alarm is acknowledged.

IV. Programming

A. Local Programming

The System shall contain an integral, sealed keypad for the purpose of locally programming all system data. Programming is assisted by synthesized voice guidance.

B. Remote Programming

The system shall be remotely programmable using a standard touch-tone telephone. Remote programming shall be aided by menu-style voice guidance. The following parameters may be remotely programmed:

1. Alarm messages
2. Identification message
3. Turn output on/off
4. Disable/enable inputs

V. Remote Operation Features

A. Status Report

The system shall allow the user to call into the unit at any time using any standard telephone to obtain a full status report of all monitored channels including present temperature and listen-in to on-site sounds. The status report shall be articulated using the resident voice-synthesized English vocabulary, in combination with digitized user-recorded voice messages.

B. Acknowledgment

An alarm on any monitored channel may be acknowledged remotely by pressing tones on a touch-tone telephone keypad or by calling the system back within a specified time period. An alarm may also be acknowledged locally using the built-in keypad.

VI. Enclosure and Environmental

A. Enclosure

The system shall be housed in a NEMA-4X fiberglass enclosure with a latched clear cover and shall be internally constructed to facilitate field upgrades, repair, and maintenance.

B. Power

The system shall be provided with a UL listed 12V AC power transformer that the user may plug into a 117V AC outlet, $\pm 20\%$, 60Hz.

C. Local Visual Indication

Each input shall have a corresponding LED that will indicate the alarm and acknowledgment status of each input.

D. Battery Backup

The system shall have a built-in 12V 1.9 AH sealed lead-acid rechargeable battery. This battery shall support approximately 12 hours of continued system operation in the absence of AC power.

E. Electrical Protection

Power and telephone connection shall have internal spike and surge protection using metal oxide varistors. The dry contact inputs shall be optically isolated.

F. Additional Electrical Surge Protection

Additional Power and Telephone line surge protection shall be available from the manufacturer. When so installed, the system shall be fully warranted against any damage caused by transient surges entering the system through Power or Telephone lines.

G. Environmental

The system shall function over an operating range of 32° F - 120° F at up to 0 - 90% RH, non-condensing.

H. Maintenance

The system manufacturer shall have in-house service facilities and technical assistance available during normal business hours (EST).

Specifications subject to change without notice.

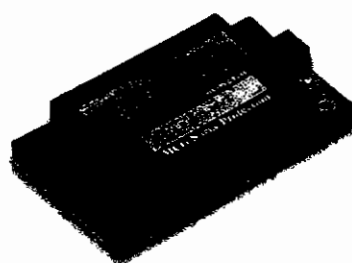
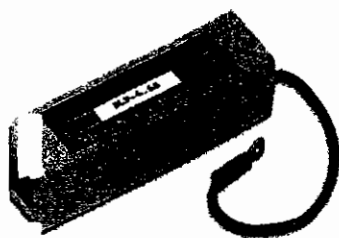
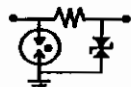
Phonetics, Inc.

901 Tryens Road
Aston, PA 19014

Phone: (610)558-2700 FAX: (610)558-0222
www.sensaphone.com

DLP-4.68 & DLP-4.71

Protects Modems, Fax, Telco, T1, E1



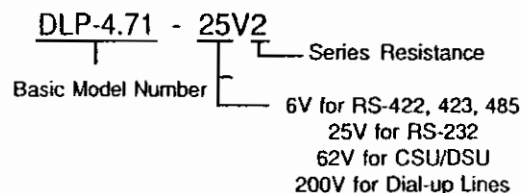
Modems, facsimile machines and telephone equipment are easily damaged by transients caused by lightning and switching surges. The DLP-4 series installs in minutes between the telephone/data line and the sensitive equipment to provide quick and dependable protection for I/O ports.

The DLP-4.68 handles hit after hit without degradation. Employing fast-acting Avalanche diodes ensures ongoing protection, even under demanding conditions.

For particularly severe transient conditions, model DLP-4.71 incorporates a gas diode for substantially greater heavy-duty diversion capability. Protection circuitry on both units automatically resets after the transient has passed.

Model	DLP-4.68	DLP-4.71
Duty	General	Heavy
Connector	RJ11/45/48 (F/F)	1-RJ11 (F/F)
Protected Pins	1-8	2, 3, 4, 5
Series Rs	-	2.4 Ohms
Attenuation	<1db at 10 MHz	<1db at 10 MHz
Mounting	3.5" x 1" x 1"	4.2" x 2.25" x .185" ID
UL	497B	497A (Fuse), 497B

Ordering Information

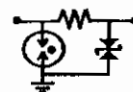


Note: Use Suffix F for Fusing.

MCG Surge Protection

DLP-5.10

Protects 10BASE-T, Token Ring, I/O Ports



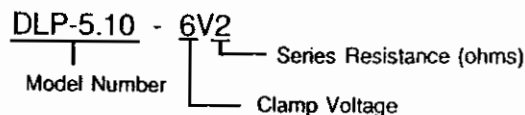
The DLP-5.10 is a heavy-duty wideband protector that prevents cable transients from damaging sensitive loads. When sensing a transient on either the shield or the center conductor, the DLP-5.10 operates in nanoseconds to automatically shunt damaging transients to earth ground.

The unit offers ideal protection for 10BASE-T, HUBs, Routers, token ring and I/O ports.

Installation is quick and easy using BNC connectors. The DLP-5.10, like all MCG protectors, is backed with a 10 year, no-nonsense warranty. Please call our Tech Support staff with all you application questions.

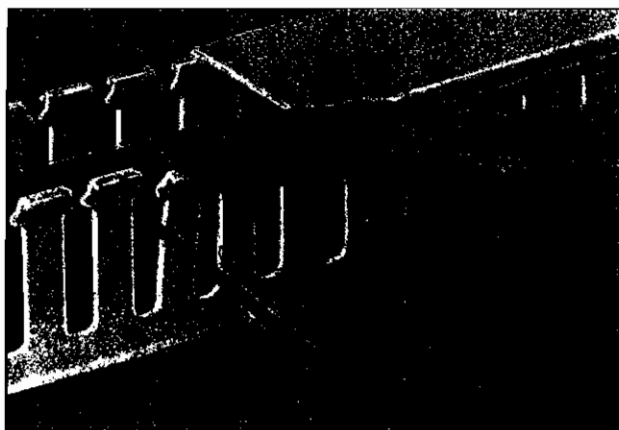
Model	DLP-5.10
Duty	Heavy
Connector	BNC (F/F)
Clamp V	6V
Protected Lines	Center & Shield
Series Rs	2 Ohms
Attenuation	<1db at 70 MHz
Mounting	4.2" x 1.50" x .185" ID
UL	497B

Ordering Information



1-800-851-1508
<http://www.mcgsurge.com>

Type NE Slotted Wall Duct - Components



Type NE Slotted Wall Duct

- Made of NORYL® Chlorine free material (See page 34 for material specifications)
- Rated for continuous use temperatures -40°C (-40°F) up to 95°C (203°F)
- Available in White color only
- Provided with standard mounting holes (See page 32 for dimensions)
- Available without mounting holes (See below)
- Available with adhesive backing* (See page 20 for details)



UL RECOGNIZED
File No. E147128



CSA CERTIFIED
File No. 16446

Note: Order DUCT and COVER separately

DUCT PART NUMBER	NOMINAL DUCT SIZE†		COVER PART NUMBER	Std. Length	Duct Std. Ctn. Qty.	Cover Std. Ctn. Qty.
	WIDTH in (mm)	HEIGHT in (mm)				
NE1/8WH6	.50 (12.7)	.62 (15.7)	NE1/8WH6	6 ft	120 ft	120 ft
NE1/4WH6		1.00 (25.4)			120 ft	120 ft
NE1/2WH6		1.25 (31.8)			120 ft	120 ft
NE3/4WH6		1.75 (44.5)			120 ft	120 ft
NE1WH6	1.00 (25.4)	1.00 (25.4)	NE1WH6	6 ft	120 ft	120 ft
NE1 1/2WH6		1.50 (38.1)			120 ft	120 ft
NE2WH6		2.00 (50.8)			120 ft	120 ft
NE3WH6		3.00 (76.2)			120 ft	120 ft
NE4WH6	1.50 (38.1)	4.00 (101.6)	NE4WH6	6 ft	120 ft	120 ft
NE5WH6		1.50 (38.1)			120 ft	120 ft
NE6WH6		2.00 (50.8)			120 ft	120 ft
NE7WH6		3.00 (76.2)			120 ft	120 ft
NE8WH6	2.00 (50.8)	4.00 (101.6)	NE8WH6	6 ft	60 ft	120 ft
NE9WH6		1.00 (25.4)			120 ft	120 ft
NE10WH6		2.00 (50.8)			120 ft	120 ft
NE12WH6		3.00 (76.2)			60 ft	120 ft
NE14WH6	2.50 (63.5)	4.00 (101.6)	NE14WH6	6 ft	60 ft	120 ft
NE16WH6		1.00 (25.4)			120 ft	120 ft
NE18WH6		2.00 (50.8)			120 ft	120 ft
NE20WH6		3.00 (76.2)			60 ft	120 ft
NE22WH6	3.00 (76.2)	4.00 (101.6)	NE22WH6	6 ft	60 ft	120 ft
NE24WH6		5.00 (127.0)			60 ft	120 ft
NE26WH6		2.00 (50.8)			60 ft	120 ft
NE28WH6		3.00 (76.2)			60 ft	120 ft
NE30WH6	4.00 (101.6)	4.00 (101.6)	NE30WH6	6 ft	60 ft	120 ft
NE32WH6		5.00 (127.0)			60 ft	120 ft
NE34WH6		2.00 (50.8)			60 ft	120 ft
NE36WH6		3.00 (76.2)			60 ft	120 ft

Ordering Information:

Order number of feet required in multiples of 6 feet or Standard Carton quantities.

To order duct without mounting holes, add NM to the Part Number.

To order with pressure-sensitive adhesive tape applied, add -A to the Part Number.

*Adhesive tape is not CSA Certified.

†See page 32 for exact dimensions.

See pages 21-26 for full line of wiring duct accessories and tools.

SECTION E8
LIGHTING FIXTURES

SUBMITTAL COVER

PARSONS ENGINEERING SCIENCE, INC. PROJECT NO. 733549.10100

CONTRACTOR: HASELEY CONSTRUCTION COMPANY, INC.

ADDRESS: 10315 LOCKPORT ROAD, NIAGARA FALLS, NY 14304

PROJECT: NIAGARA COUNTY REFUSE SITE SUBMITTAL NO: 49E

DATE OF SUBMITTAL: 01/28/99

TYPE OF SUBMITTAL (CHECK ONE)

☒ Product Data	☐ Schedule	☐ Performance Data
☐ Sample	☐ Warranty	☐ Operations & Maintenance Data
☐ Color Selection	☐ Test Report	☐ Record Document

DESCRIPTION OF SUBMITTAL:

Product Name: LIGHTING FIXTURES

Manufacturer: VARIOUS

Subcontractor/Supplier: CIR ELECTRICAL CONSTRUCTION CORP.

Section No.(s): _____ Drawing No.(s): E-6

Part/Paragraph: _____ Detail Reference: _____

ENGINEER'S APPROVAL

SUBMITTAL REVIEWED SOLELY FOR GENERAL COMPLIANCE WITH CONTRACT REQUIREMENTS	
DATE/BY <u>2-2-99 KD</u>	
FABRICATION/INSTALLATION/PRODUCTION MAY PROCEED.	
PARSONS ENGINEERING SCIENCE	

CONTRACTOR'S APPROVAL STAMP

NIAGARA COUNTY REFUSE SITE
HASELEY CONSTRUCTION CO., INC.

Date: 1/28/99

Item: LIGHTING FIXTURES

Specification: ELECTRICAL

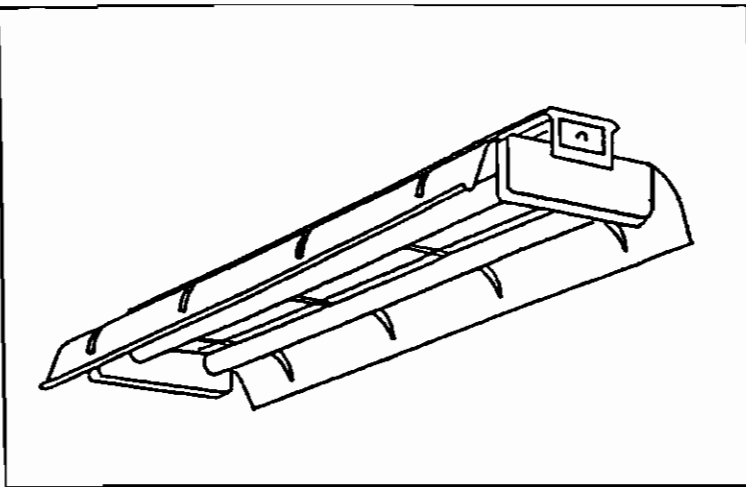
Section: _____ Para. No. _____

Drawing No.: E-6 Page No. _____

Location: NCRS Submittal No. 49E
APPROVED BY: WILLIAM L. BEY

RECEIVED STAMPS

RECEIVED
JAN 29 1999
BY: <u>K. D. [Signature]</u>



KL4-2 KL8-2 DYNAMO INDUSTRIAL TWO LAMP RAPID START

Niagara County Refuse Site
Type H, H1
Cat #: KL4-240-LE120-KHC

FEATURES:

- Available in 4' and 8' lengths.
- Reflectors have 15% uplight.
- Spring loaded turret lampholders.
- 6" lamp spacing.
- For individual or continuous row mounting.
- Channel ends double as joiners.
- Reflector end closures available.

SPECIFICATIONS:

Housing

Heavy steel with longitudinal reinforcing ribs for extra strength.

Reflector

Die embossed with transverse ribs for maximum rigidity.
Smooth extruded apertures for 15% uplight.

Ballasts

Energy efficient, 40 watt Rapid Start thermally protected, automatic resetting, Class P, high power factor, CBM, sound rated A, unless otherwise specified.

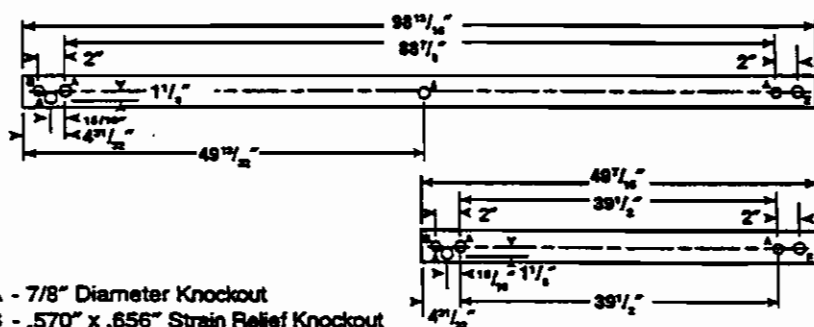
Finish

All parts pre-painted with high gloss baked white enamel, minimum reflectance 86%, applied over iron phosphate pre-treatment for maximum adhesion and rust resistance.

Labels

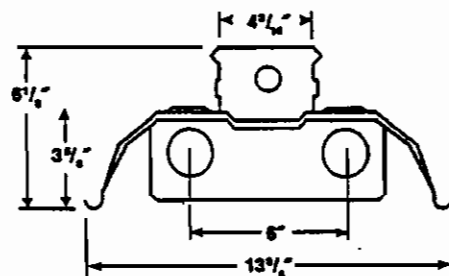
All fixtures carry the U.L. label. (CSA approval available. Use Suffix "CSA").

Cross Section

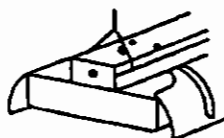


- A - 7/8" Diameter Knockout
B - .570" x .656" Strain Relief Knockout
E - 1-1/8" Diameter Knockout

Note: All dimensions are in inches; dimensions are subject to change without notice. Please consult factory or check sample for verification.



Mounting Accessories



KHC



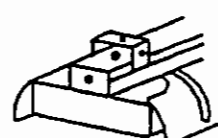
S18



KZTF



KZT



KTH

Environmental Laboratories

REPORT # 10183
DATE: 7/14/92

LUMINAIRE: KL4-232-OCT-PAF

1 x 4 2-LAMP INDUSTRIAL WITH APERTURED WHITE REFLECTOR
BALLAST: RDP221 LAMP: P032/41K; BAL. FAC.: .95; WATTS: 74
LAMPS RATED AT 2700 LUMENS EACH
LUMINOUS AREA: 48 x 12.25

REFLECTANCE: SNE .95

MOUNTING: PENDANT

S/P/H: PAF 1.20 NORM 1.32

SHIELDING: PAF 2 NORM 1.2

CANDLEPOWER				
0	22.5	45	67.5	90
10	1385	1385	1385	1385
20	1375	1375	1384	1381
30	1351	1351	1359	1346
40	1344	1344	1336	1327
50	1117	1122	1109	1104
60	950	960	973	1031
70	751	776	823	849
80	528	557	585	619
90	290	331	415	427
100	71	98	95	92
110	7	34	40	42
120	19	33	44	49
130	80	29	32	101
140	175	36	40	90
150	249	119	31	42
160	335	184	114	76
170	426	262	193	143
180	433	359	265	239
190	473	437	391	336
200	454	485	494	493
210	483	483	483	483

ZONAL SUMMARY		
ZONE LUMENS	LAMP F1X2	
0-30	1000	18.8 26.9
0-40	1003	31.1 34.7
0-60	3307	57.8 63.6
0-90	4386	73.6 84.4
0-120	178	3.1 3.4
0-130	262	4.3 5.0
0-150	314	8.9 9.9
0-180	812	14.0 15.6
0-190	5195	89.6 100.0

This photometric test was performed using a specific ballast / lamp combination. Extrapolation of these data for other ballast / lamp combinations may produce erroneous results. The ballast factor must be applied to the lumen output rating assigned to the lamp(s) or to the condenser values shown.

Luminaire efficiency rating (LER)
per ANSI L89-1992.

LER = F1- 67

TESTED BY: RK

APPROVED BY: EJP

TEST RUN IN ACCORDANCE TO CURRENT I.E.S. PUBLISHED PROCEDURES

Coefficients of Utilization

Zonal Cavity Method

Coefficients of Utilization

Floor Reflectance = .20

RC RW	80				70				50				0	
	70	50	30	10	70	50	30	10	50	30	10	0	0	0
1	94	90	87	83	91	87	84	81	81	78	75	64		
2	86	79	73	68	82	76	70	66	70	66	62	53		
3	78	69	62	57	75	67	60	55	62	57	52	45		
4	72	61	54	48	69	59	52	47	55	49	45	38		
5	65	54	46	40	62	52	45	39	49	42	38	32		
6	60	48	40	34	57	47	39	34	43	37	32	28		
7	55	43	35	30	53	42	34	29	39	33	28	24		
8	51	39	31	26	49	37	30	25	35	29	24	20		
9	47	35	27	22	45	33	26	22	31	25	21	17		
10	43	31	24	19	42	30	24	19	29	23	18	15		

Energy Data

LER: F1-67

Energy Cost: \$3.58*

Input Watts: 74

BF: .95

The above energy calculations were conducted using a specific lamp/ballast combination. Actual results may vary depending upon the lamp and ballast used. Lamp and ballast specifications are subject to change without notice.

*Comparative annual lighting energy cost per 1000 lumens based on 3000 hours and \$0.08 per KWH.

Ordering Information

Example: KL4-240-LE120-GLR-PAF

KL - 2									
Series	KL	Ballast	EB8 - Electronic T8 EB12 - Electronic T12 EB12LH - Electronic T12 <10% THD EB8LH - Electronic T8 <10% THD 4EB8 - 4 Lamp Electronic T8 4EB8LH - 4 Lamp Electronic T8 <10% THD	Voltage	120 - 120V 270 - 270V 347 - 347V	Industrial Options	GLR - Fast Blow Fuse GMF - Slow Blow Fuse EL - Emergency Battery Pack BC - Branch Circuit Plug-on Wiring System (See options section for details.) CSA - Approved, Canadian Standards Association PAF - Paint After Fabrication	Industrial Accessories	Order Separately KZTF - Zip Tee Hanger - flush mounting on tee bar ceiling KZT - Zip Tee Hanger - 1-1/2" spacer on tee bar ceiling KTH - Slide Clamp Tong Hanger S18 - 18" Stem, canopy and 8" aligner SS18 - 18", 45" Swivel Stem & Canopy KHC - 24" Chain Hanging Assembly KLEC - Reflector end closure KLWG4 - Wire Guard 4' lg. - 2 required per 8' fixture
Size	4 - 4' 8 - 8'	LE	Magnetic T12						
No. of Lamps in Cross Section	2 - Two	OCT	Magnetic T8						
Lamp Type	40 - 4' T12, 40 Watt 32 - 4' T8, 32 Watt	Z	Zero Degree Magnetic*						
Reflector Type	Blank - Apertured Reflector for Uplight (Std) ST - Solid Top (no Uplight)	For a specific ballast vendor, show as option							

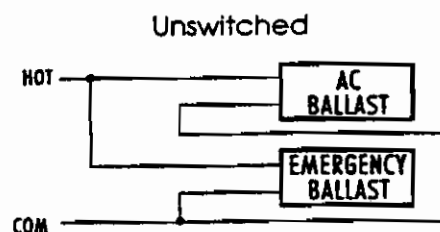
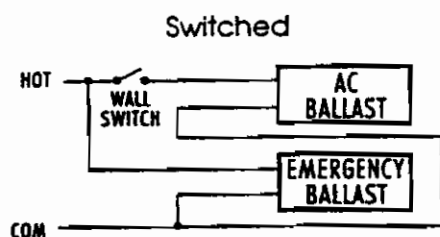
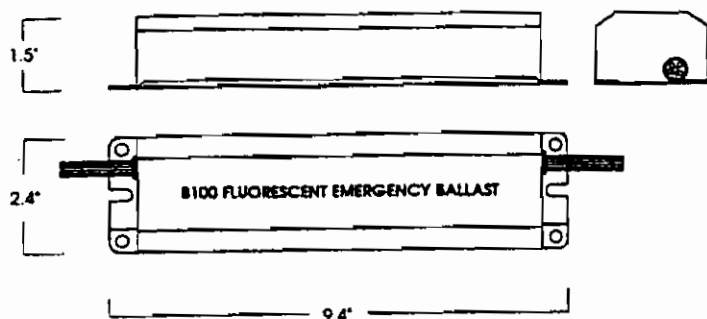
For complete list of options and accessories, see options and accessories section.

* Not for use with energy saving lamps.



bodine
EMERGENCY LIGHTING

**B100 FLUORESCENT
EMERGENCY BALLAST**
CONVENIENT CODE COMPLIANCE
**Niagara County Refuse Site
Type H1
Cat #: B100**



Primary circuit only. Lamp leads not shown.



LISTED

APPLICATION

The B100 fluorescent emergency ballast works in conjunction with the AC ballast to convert new or existing fluorescent fixtures into emergency lighting. The emergency ballast consists of a high-temperature nickel cadmium battery, charger and electronic circuitry in one compact red case.

The B100 can be used with most 20 W through 40 W (2' -4') T8, T10, or T12 fluorescent lamps without integral starters, including U-shaped, HO, VHO, circline, energy saving, and (4-pin) compacts. It is also compatible with most 1, 2, 3, and 4-lamp *electronic*, standard, energy saving, and dimming AC ballasts. If used in an emergency-only fixture, no AC ballast is necessary. The B100 is not suitable for use in air handling heated air outlet fixtures, and wet, damp, or hazardous location fixtures. For information about specific lamps and ballast compatibility, please call the factory.

OPERATION

When AC power fails, the B100 immediately switches to the emergency mode, keeping one lamp illuminated at a reduced lumen output for a minimum of 90 minutes. When AC power is restored, the B100 automatically returns to the charging mode.

INSTALLATION

The B100 does not affect normal fixture operation and may be used with either a switched or unswitched fixture. If a switched fixture is used, an unswitched hot lead must be connected to the emergency ballast. The emergency ballast must be fed from the same branch circuit as the AC ballast. The B100 may be installed inside, on top of, or remote from the fixture. The emergency ballast may be remote-installed up to half the distance the AC ballast manufacturer recommends removing the AC ballast from the lamp, or up to 50 feet, whichever is less. Installation is not recommended with fixtures where the ambient temperature may fall below 0°C for extended periods.

UL and CODE COMPLIANCE

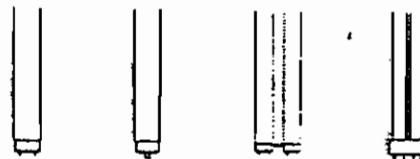
The B100 has been tested by Underwriters Laboratories in accordance with the standards set forth in UL924 - "Emergency Lighting and Power Equipment," and is UL Listed for factory installation or field retrofit. Emergency illumination time exceeds the National Electrical Code (NEC), Life Safety Code (NFPA-LSC) and UL 90-minute requirements.

SPECIFIERS REFERENCE

Project	Type H1	Model No. B100
Comments FIELD INSTALL		

B100 FLUORESCENT EMERGENCY BALLAST

CONVENIENT CODE COMPLIANCE



BATTERY

Since high temperatures exist in fluorescent fixtures, the B100 uses a specially constructed, high-temperature nickel cadmium battery. This battery requires no maintenance, and has a life expectancy of 7 to 10 years.

EMERGENCY ILLUMINATION

The B100 produces 350 to 450 lumens initial emergency light output. During emergency illumination, one lamp is illuminated, even if installed with a multi-lamp AC ballast. Emergency lumen output will be less with a compact fluorescent lamp.

SPECIFICATION

Emergency lighting shall be provided by using a standard fluorescent fixture equipped with a Bodine B100 emergency ballast. This emergency ballast shall consist of a high-temperature, maintenance-free nickel cadmium battery, charger and electronic circuitry contained in one 9 3/8" x 2 3/8" x 1 1/2" red metal case. A solid-state charging indicator light to monitor the charger and battery, a single-pole test switch, and installation hardware shall be provided. The emergency ballast shall be capable of operating one 20 W - 40 W (2'-4') T8, T10, or T12 fluorescent lamp or (4-pin) compact fluorescent lamp at reduced illumination in the emergency mode for a minimum of 90 minutes. The B100 shall produce 350 to 450 lumens initial emergency light output, have 3.5 Watts of input power, a 9.6 Watt-hour battery capacity, and comply with emergency standards set forth by the current NEC. The emergency ballast shall be UL Listed for installation inside, on top of, or remote from the fixture, warranted for a full year from date of purchase, and made in the U.S.A.

WARRANTY

Model B100 is warranted for one (1) full year from date of purchase. This warranty covers only properly installed Bodine emergency ballasts used under normal conditions. For the warranty period Bodine will, at its option, repair or replace without charge a defective emergency ballast, provided it is returned to the factory transportation prepaid, and our inspection determines it to be defective under terms of the warranty. Repair or replacement, as stated above, shall constitute the purchaser's exclusive warranty, which does not extend to transportation, installation, labor or any other charges; nor does it apply to any equipment of another manufacturer used in conjunction with the emergency ballast.

Product Summary

UL LISTED Factory Or Field Installation	Charging Current 280 mA
Initial Light Output 350 - 450 Lumens	Battery High-Temperature, Maintenance-Free Nickel Cadmium Battery 7 to 10 Year Life Expectancy
Illumination Time 90 Minutes	Electrical Rating 3.5 Watts
Test Switch Single Pole	Warranty 1 Year (NOT pro-rata)
Charging Indicator Light LED	Weight 2.1 lbs.
Recharge Time 24 Hours	Dimensions 9.4" x 2.4" x 1.5" (238 mm x 60 mm x 38 mm) Mounting center 8.9" (226 mm)
Ballast Temperature Rating 0°C to + 55°C	
Dual Input Voltage 120/277 VAC, 60 Hz	

Emergency ballasts can be modified to accommodate special voltages, frequencies, and longer run times.

CSA certified model also available.

Standard Features

Application - Security lighting for parking, walkways, platforms and rec. areas.

Construction - Die cast aluminum with a polycarbonate lens.

Finish - Bronze.

Lamp - Included.

Electrical - UL Listed Wet.

Options Available

- Multi Tap Ballast HPS, MH (MTB-HPS, MTB-MH)
- High Power Factor HPS Capacitor (HPF)
- Photo Control (PHC)
- Tamper Proof Screws (TPS)
- White Housing (WH)

MODEL #	LAMP
HPS-35W	35W HPS
HPS-50W	50W HPS
HPS-70W	70W HPS
HPS-100W	100W HPS
MH-50W	50W MH
MH-70W	70W MH

Standard Features

Application - Surface mounted security lighting.

Construction - Die cast aluminum with a glass lens.

Finish - Bronze.

Lamp - Included.

Electrical - UL Listed Wet.

Options Available

- Multi Tap Ballast HPS, or MH (MTB-HPS, MTB-MH)
- High Power Factor HPS Capacitor (HPF)
- Photo Control (PHC)
- Vandalproof Polycarbonate Guard (VPG)
- Wire Guard (WG)
- Tamper Proof Screws (TPS)
- White Housing (WH)

MODEL #	LAMP
MHPS-70W	70W HPS
MHPS-100W	100W HPS
MHPS-150W	150W HPS
MHPS-200W	200W HPS
MH-100W	100W MH
MH-150W	150W MH
MH-175W	175W MH

Standard Features

Application - Surface mounted security lighting for parking areas, perimeter lighting, entrances and walkways.

Construction - Die cast aluminum with a glass lens.

Finish - Bronze.

Lamp - Included.

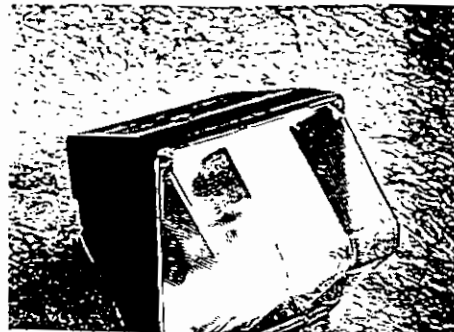
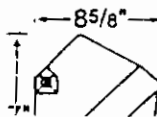
Electrical - UL Listed Wet.

Options Available

- Photo Control (PHC) *Please Specify 120V or 277V*
- White Housing (WH)
- Vandalproof Polycarbonate Guard (VPG)
- Wire Guard (WG)

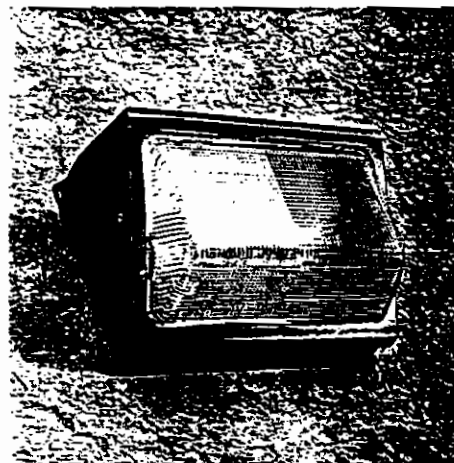
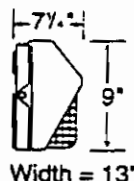
MODEL #	LAMP
LHPS-250	250W HPS
LHPS-400	400W HPS
LMH-250	250W MH
LMH-400	400W MH

MINI-WALLPAK

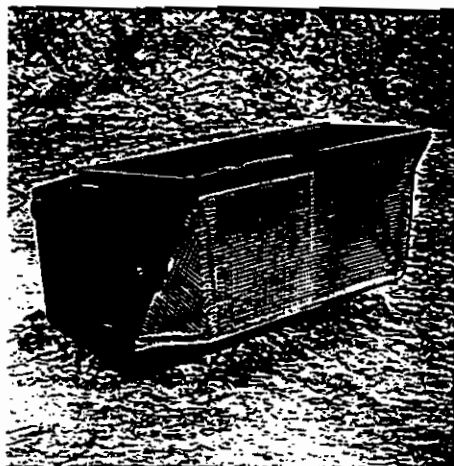


Niagara County Refuse Site
Type D
Cat #: MHPS-100W-PHC-WG

MED-WALLPAK



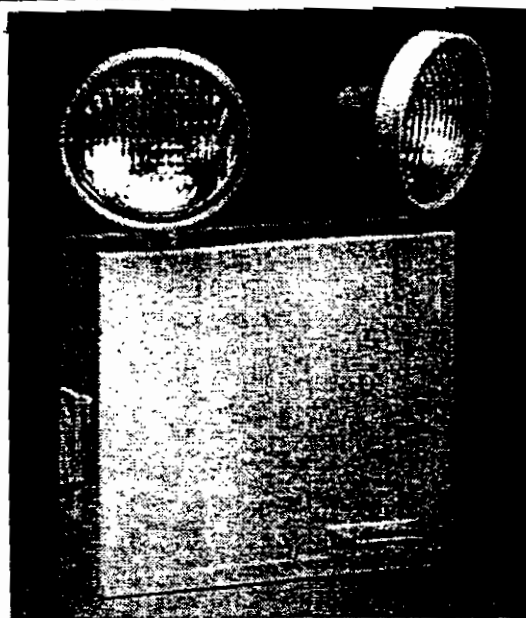
LARGE-WALLPAK





SERIES PG, P12G

Niagara County Refuse Site
Type E
Cat #: 2P012G1/L18-M



**NOW AVAILABLE
WITH MICROCOMPUTER
DIAGNOSTICS!**

*Industrial/
Commercial Unit
Equipment —
6 or 12 Volt
Maintenance-free
Lead Calcium Battery*



application Traditional styling designed to meet most requirements for moderate loads. Reliable, economic units for all public areas.

features

- **HOUSING:** Heavy duty steel case with front access panel and mist white enamel finish.
- **MOUNTING:** Conduit knockouts and rear keyhole mounting slots are provided.
- **ELECTRONICS:**
 - Automatic, temperature compensated, pulse type charger.
 - High capacity, automatic, dust-tight instantaneous transfer relay.
 - Low voltage disconnect prevents overdischarge of battery. Automatic brownout protection is provided.
 - Labor saving AC line latch prevents battery discharge during installation to a non-energized circuit.
 - Fused output circuit (PG2, P12G1).
- **CONTROLS:**
 - Red charge monitor LED indicates state of charge of the battery.
 - Orange AC-ON LED indicates AC power is on.
 - Momentary test switch allows for quick operational check of entire system.
- **POWER REQUIREMENTS:**
120/277 Volt AC

battery

6 or 12 volt, long life, maintenance-free sealed lead calcium.

lamp heads

PAR 36 size, high impact mar-resistant thermoplastic heads, furnished with high intensity incandescent lamps. Heads can be top or side mounted and easily moved to either location by contractor without re-wiring.

Note: Tungsten halogen lamps optional. See unit selection chart. For isofootcandle distribution curves see pages CD1-7.

options

(Add Suffix to Model No.)

Volmeter	-V
Disconnect Switch	-DS
Microcomputer Diagnostics	-ID
Self-Diagnostics	-SD

accessories

(Order as separate item) Model

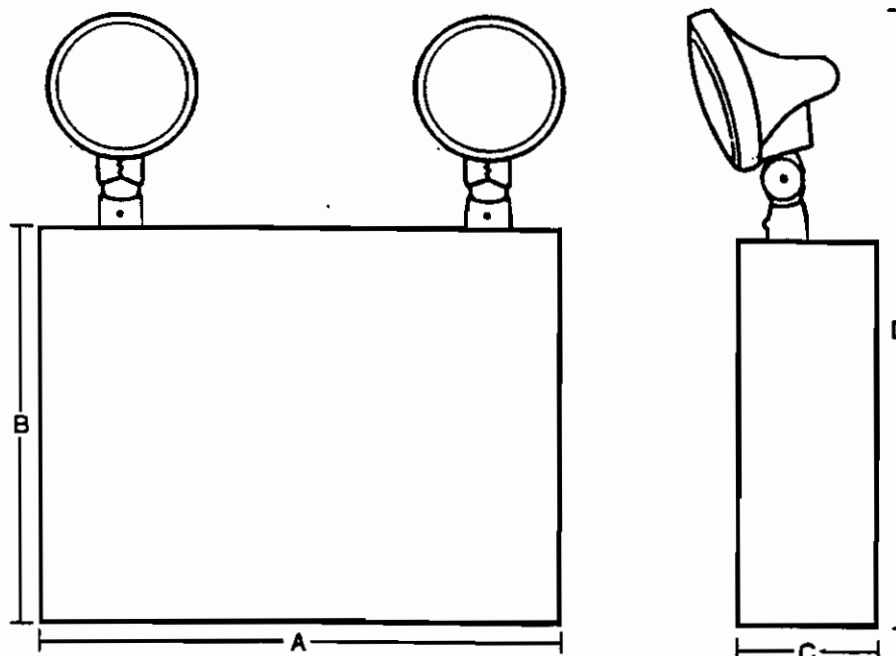
3-wire Cord & Plug	3CP
3-wire Cord & Plug (277V)	3CP-277
Guard	G8
Time Delay Kit (12 min)	TDK

ordering format

2	PG	1	L9-M	-DS
Number of heads	Capacity indicator		Lamp Suffix	Option (Disconnect Switch)
Series				Mist White Finish

unit selection chart:

Volts	Model No. (unit/Lamp Suffix)	Capacity in Watts to 87 1/2 % of Nominal Battery Voltage				Standard Lamps		
		1 1/2 Hrs.	2 Hrs.	3 Hrs.	4 Hrs.	Watts/ Heads	Type	Lamp Rp/c. No.
6	2PG1/L9-M	18	15	—	—	9	Incand.	570.0016
	2PG2/L9-M	54	36	27	18	18	Incand.	570.0016
12	2P12G1/L18-M	54	36	27	18	18	Incand.	570.0029



Model	Dimensions			
	A	B	C	D
2PG1				
2PG2	12.75"	6.45"	3.14"	14.45"
2P12G1				

GENERAL: The contractor shall furnish and install 6 or 12 volt emergency lighting units, as indicated on all plans. Input power shall be 120/277 volt 60 Hz.

HOUSING: The battery and all components shall be housed in a compact 18 gauge steel case, with front access cover. Finish shall be mist white enamel.

LAMP HEADS: The unit shall be provided with one, two (or three for PG2, P12G1) standard lamp assemblies constructed of high impact thermoplastic material, with access to lamp for replacement and finished in a color to match the unit. The heads shall be fully adjustable horizontally and vertically. Lamp heads shall be supplied top mounted but can be easily side mounted by contractor without re-wiring.

BATTERY: Unit shall contain a 6 or 12 volt sealed, non-refillable, maintenance-free lead calcium battery. Capacity shall be as shown in Unit Selection Chart.

TRANSFER: The sealed dust-tight transfer relay shall automatically and instantaneously connect the DC lamp load to the battery upon failure of the normal AC supply, and shall disconnect the DC lamps when normal power is restored.

CHARGER ASSEMBLY: An automatic, temperature compensated, pulse type charger shall be provided. The charger shall be reverse polarity protected, short circuit proof and capable of recharging the battery in accordance with UL924.

A low voltage disconnect shall be provided to shut off the lamp load and circuitry when battery reaches 87½% discharge to protect battery from possible damage due to deep discharge. Brownout circuit shall be provided which activates emergency mode when AC power dips below 80-85% of nominal voltage. AC line latch circuit shall be provided which prevents battery discharge during installation to a non-energized circuit.

CONTROLS: AC-ON LED shall be provided to indicate the presence of AC power to the unit. Charger monitor LED shall be provided to indicate state of charge of the battery. Momentary test switch shall be provided to allow for periodic testing of the entire system.

WARRANTY: Entire unit (less lamps, pilot lights & fuses) shall carry a 3 year full warranty against defects in parts or workmanship under normal and proper use. The sealed lead calcium battery shall carry an additional 3 year pro-rata warranty.

MANUFACTURER:
Unit shall be Lightalarms Model _____



Lightalarms

Lightalarms Electronics Corporation

Member of the Kaufel Group of Companies

1170 Atlantic Avenue, PO Box 512, Baldwin, New York 11510-0512

(516) 379-1000 Fax: (516) 379-1698

SECTION E9
GUARANTEE



COMMERCIAL • INDUSTRIAL • INSTITUTIONAL • INSTALLATIONS
SERVING BUFFALO AND NIAGARA FALLS

January 6, 2000

Niagara County Refuse Site
Wheatfield, New York

RE: Niagara County Refuse Site

This letter is written to officially notify Niagara County Refuse Site that the mechanical system installed by CIR Electric has been completed and tested and startup accomplished.

The warranty period for all defects in workmanship, including parts and labor to correct same is from Jan. 1, 2000 to Jan 1, 2001. Should you encounter any problems please contact our 24-hour service number at (716) 874-5614.

CIR Electric will correct defective work within a five-year period after the date of preliminary acceptance of the work, in addition to their one-year guarantee.

Sincerely Yours,

A handwritten signature in cursive script, reading "Greg Jakubowski".

Greg Jakubowski
Vice President



SECTION M1
EQUIPMENT SUPPLIERS

JOHN W. DANFORTH COMPANY

Niagara County Refuse Site
Wheatfield, New York
JWD Job # 4368

EQUIPMENT SUPPLIERS

Community Steel
60 Alabama Street
Buffalo, NY 14204
Telephone: 716-854-5927

Gehring Pumps, Inc
P.O. Box 179
Fairport, New York 14450
Telephone: 716-924-1670

R.L. Stone Company
630 Cleveland Ave.
Buffalo, New York
Telephone: 716-834-2525

Ritec Enterprises, Inc.
26 Saginaw Drive
Rochester, New York 14623
Telephone: 716-271-3170

PumpCon International, Inc.
P.O. Box 909
Conway, Ar 72033
Telephone: 501-336-9225

I.D.S. Division
Lakes Pipe & Supply Corp.
P.O. Box 429
Niagara Falls, New York
Telephone: 716-285-6631

SUBMITTAL INFORMATION FOR JOB # 4388
NIAGARA COUNTY REFUSE JOB
HASELEY TRUCKING

COMPANY	CONTACT	TELEPHONE	FAX
Community Steel	Dennis Raczyk	854-5927	854-1401
Falls Welding	Kelly	895-5601 ex 201	895-5602
Ferguson Enterprises	Mike Feeney	854-1133	854-1135
Gehring Pumps	Ed Riegle	425-4288	425-4139
IDS	Joe Edwards	285-6631	285-8619
Mead Supply	Joe Wagner	883-8200	883-2766
R. L. Stone	Hal Wright	834-2525	834-4082
Ritec	Darren Whitford	271-3170	
Statite Corporation	Bill Grunthaner	883-8808	883-4118
Stritt & Priebe	Mike Duke	834-1100	834-1101

SECTION M2
WET WELL PLATFORM STEEL

JOHN W. DANFORTH COMPANY

Niagara County Refuse Site
Wheatfield, New York
JWD JOB #4368

A - Wet Well Platform Steel

Contents:

2 pages - cover sheet

5 page - Aluminum grating for WWA thru WWD,
Product designation square structure detail,
manhole take-off flat top

Dwg. - Plans and details for wet wells A thru D

Supplied by: Community Steel

JOHN W. DANFORTH COMPANY

Niagara County Refuse Site Wheatfield, New York JWD JOB #4368

A - Wet Well Platform Steel

Contents:

2 pages - cover sheet

5 page - Aluminum grating for WWA thru WWD,
Product designation square structure detail,
manhole take-off flat top

Dwg. - Plans and details for wet wells A thru D

Supplied by: Community Steel

JOHN W. DANFORTH COMPANY

Niagara County Refuse Site Wheatfield, New York JWD JOB #4368

A - Wet Well Platform Steel

Contents:

2 pages - cover sheet

5 page - Aluminum grating for WWA thru WWD,
Product designation square structure detail,
manhole take-off flat top

Dwg. - Plans and details for wet wells A thru D

Supplied by: Community Steel

SUBMITTAL COVER

PARSONS ENGINEERING SCIENCE, INC. PROJECT NO.

733549.10100

CONTRACTOR:

HASELEY CONSTRUCTION COMPANY, INC.

ADDRESS:

10315 LOCKPORT ROAD, NIAGARA FALLS, NY 14304

PROJECT:

NIAGARA COUNTY REFUSE SITE

SUBMITTAL NO:

58

DATE OF SUBMITTAL:

01/18/99

TYPE OF SUBMITTAL (CHECK ONE)

☐

Product Data

☐

Schedule

☐

Performance Data

☐

Sample

☐

Warranty

☐

Operations & Maintenance Data

☐

Color Selection

☐

Test Report

☐

Record Document

☒

SHOP DRAWINGS

DESCRIPTION OF SUBMITTAL:

Product Name:

WETWELL PLATFORMS

Manufacturer:

COMMUNITY STEEL

Subcontractor/Supplier:

JOHN W. DANFORTH COMPANY

Section No.(s):

N/A

Drawing No.(s):

P10/P11

Part/Paragraph:

Detail Reference:

ENGINEER'S APPROVAL

CONTRACTOR'S APPROVAL STAMP

SUBMITTAL REVIEWED SOLELY
FOR GENERAL COMPLIANCE
WITH CONTRACT DOCUMENTS

DATE/BY

1-25-99

REVIEWED

AS NOTED

FABRICATION/INSTALLATION/PRODUCTION

MAY PROCEED

REVIEW AND RESUBMIT

DEFECTED

FABRICATION/INSTALLATION/PRODUCTION
MAY NOT PROCEED.

PARSONS ENGINEERING SCIENCE

NIAGARA COUNTY REFUSE SITE
HASELEY CONSTRUCTION CO., INC.

Date: 1/18/99

Item: WETWELL PLATFORMS

Specification:

Section: N/A

Para. No.

P10-P11

Drawing No.:

Page No.

Location: NCE

Submittal No. SP

APPROVED BY: WILLIAM L. BEY

AS NOTED (Dimensions)
RECEIVED STAMPS

RECEIVED

BY:

W. L. Bey

COMMUNITY
STEEL
CORP.

60 ALABAMA ST.
BUFFALO, N. Y. 14204

ENTERED FOR FABRICATION

SCHEDULED
FOR

FABRICATION

PER ARCHITECTS

APPROVED CORRECTED DWG.

DATED

SUBSEQUENT REVISIONS IN
DESIGN OR SPECIFICATIONS
WILL BE AT ADDITIONAL COST.

DATE

REVISIONS

12-30-78

DATE DRAWN

KH

DRAWN BY

CHECKED BY

CRA

ARCHITECT

JOHN W DANFORTH

GENERAL CONTRACTOR

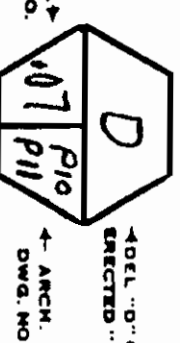
NIAGARA COUNTY
REFUSE SITE
WHEATFIELD NY

JOB NAME

ALUMINUM GRATING
FOR WWA THRU WWD

ITEM

C.S.C. →
ITEM NO.



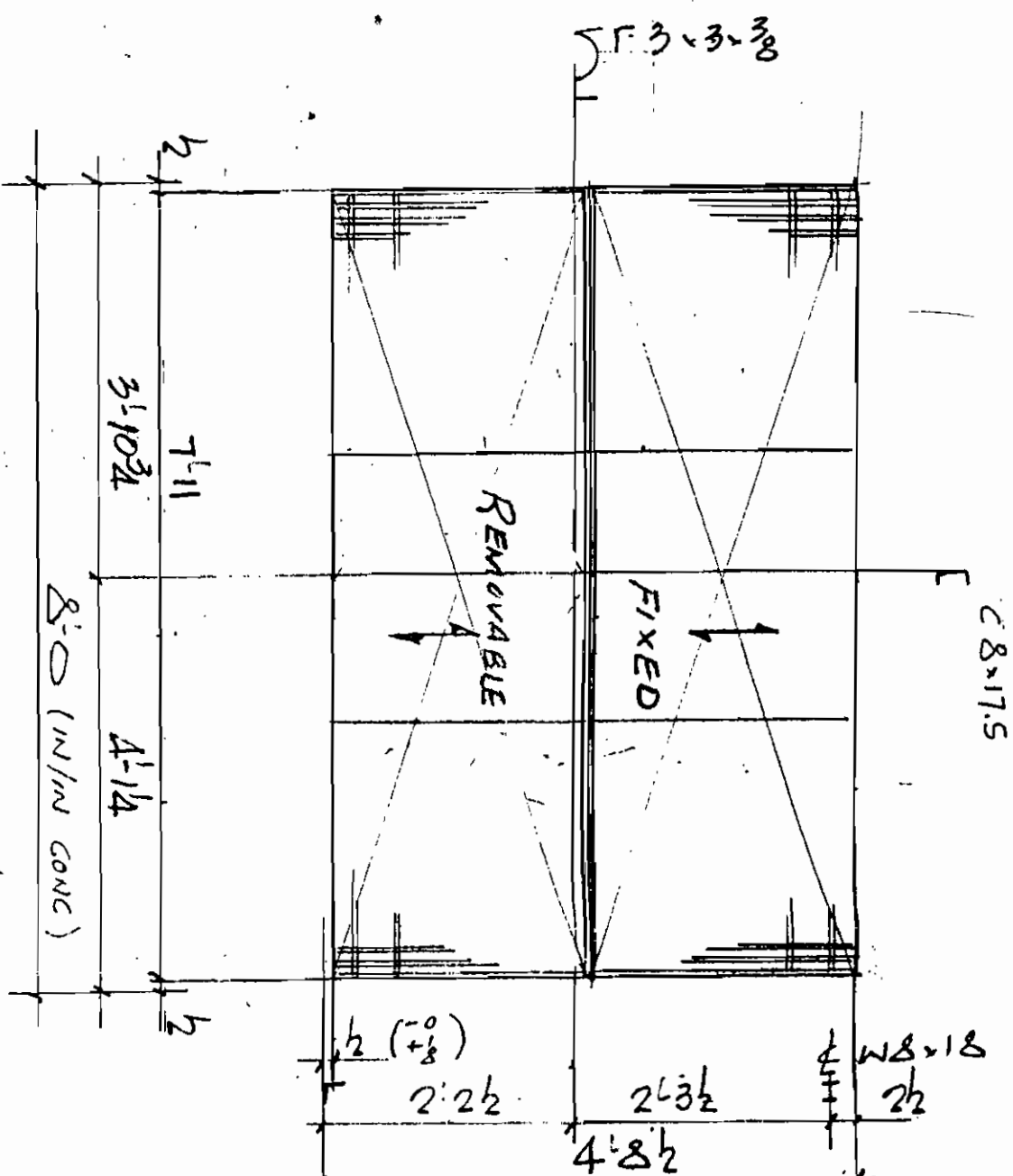
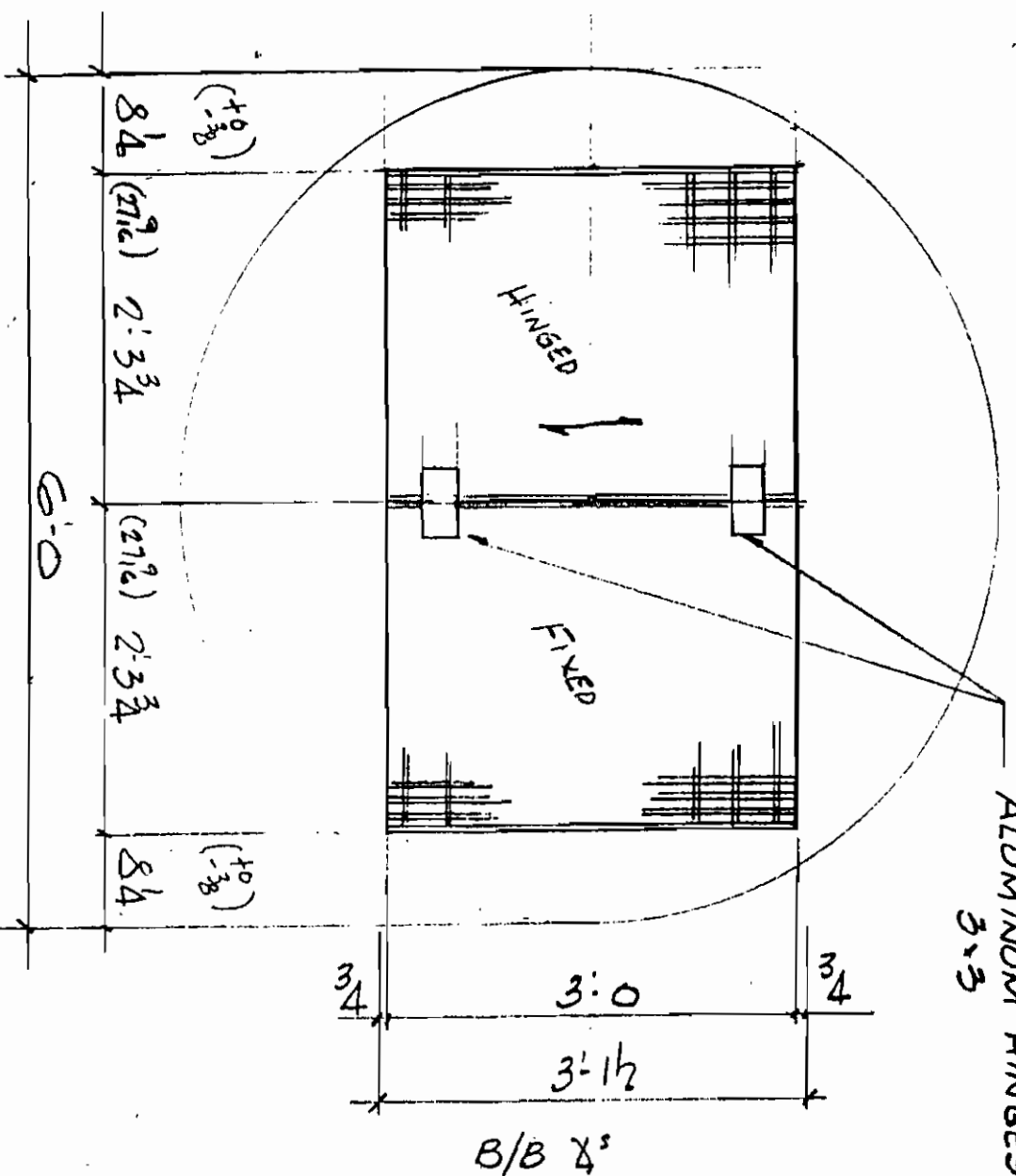
400L "D" C
ERECTED BY
← ARCH.
DWG. NO.

864

JOB NO.

SHEET NO.

ALUMINUM HINGES WELDED
3x3



MATERIAL

ALUMINUM I BAR 19-561-4 MFG BY
OHIO GRATING OR EQ. w/ ALUMINUM CLIPS
4 TEKS
BRS BARS 1' DEEP

RECEIVED

JAN 06 1979

JOHN W DANFORTH CO.

JOHN W. DANFORTH COMPANY

PROJECT : Niagara County Refuse Site

JOB NO.: 4368

CUSTOMER PROJECT NO.: 9812

ENGINEER: Conestoga Rovers & Associates

DATE OF SUBMISSION: 1/12/99

PREVIOUS SUBMISSION: _____

CONTRACTOR: JOHN W. DANFORTH COMPANY

SUBCONTRACTOR: _____

SUPPLIER: Community Steel

MANUFACTURER: _____

SPEC. SECTION: Wet Well Platform Steel

DEVIATIONS NOTED: _____

RECEIVED
JAN 13 1999
JOHN W. DANFORTH CO.

JOHN W. DANFORTH CO.

12-1-99

JOHN W. DANFORTH CO.
12-1-99



KISTNER CONCRETE
PRODUCTS INC.
8713 READ ROAD
E. PEMBROKE, N.Y.
14056
(716) 894-2267

PRODUCT DESIGNATION SQUARE STRUCTURE DETAIL

DWG. NO.
LS-SVPD
2-24-94

2" FOREMAN
7'6" WWC+D
8 hole
INVERT EL. 573.0
± EL 573.08

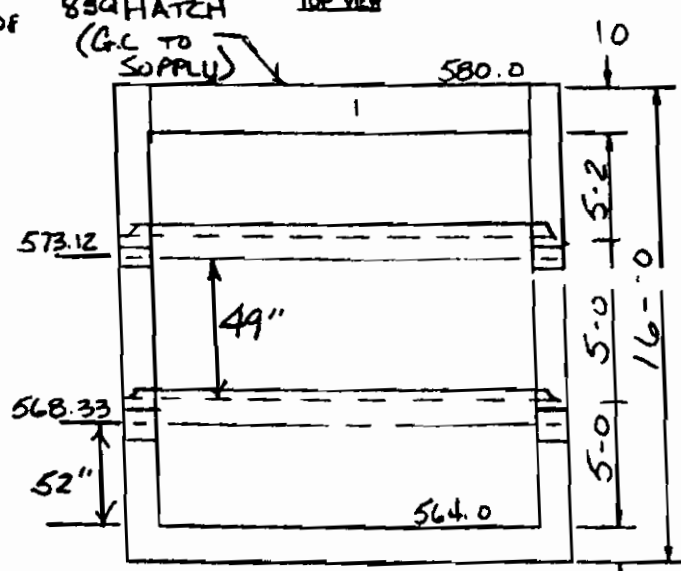
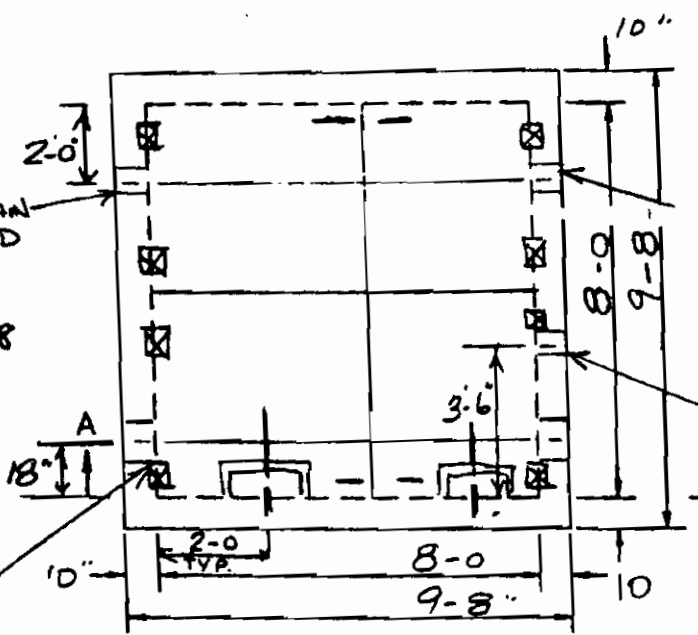
2" FOREMAN
7'6" WWC
8 hole
INVERT EL 573.0
± EL 573.08

3" HDPE
8" hole
TO CITY SAN.
MANHOLE
INVERT EL 573.
± 573.12

6" DRAIN
8 hole
INVERT EL 568.06
± EL 568.33
TYPE OF 2

8" HATCH
(G.C. TO
SUPPLY)

Rim - 580.0
INV. 564.0
DIFF. 16.0
F&C ADT
INVERT F
Sump
TBS TO TT 16.0



SECTION A-A

PIPE TO MANHOLE CONNECTIONS	PIPE TO FIT	PIPE SIZE	C1
PIPE TO MANHOLE CONNECTIONS	WATER TIGHT BOOT	PIPE SIZE	C2
LINK SEAL BY G.C.	SLEEVE CAST IN G.C. TO SUPPLY	PIPE SIZE	C3

☒ POLYPROPYLENE STEPS

LADDER - HARDWARE AND INSTALLATION BY G.C.

☐ ALUMINUM LENGTH

☐ GALVANIZED LENGTH

☐ FIBERGLASS LENGTH

☒ NONE REQ'D

JOINT DETAIL

☒ ST-TJO-BW2

☐ ST-TJO

MFG'S RECOMMENDATION

BITUMINOUS COATINGS

☐ INTERIOR

☐ EXTERIOR

☒ NONE

☐ BY G.C.

SUMP

☐ RECESS SIZE

☐ PIT SIZE

☐ HOLE SIZE

☒ NONE REQ'D

PRODUCT: WET WELL A

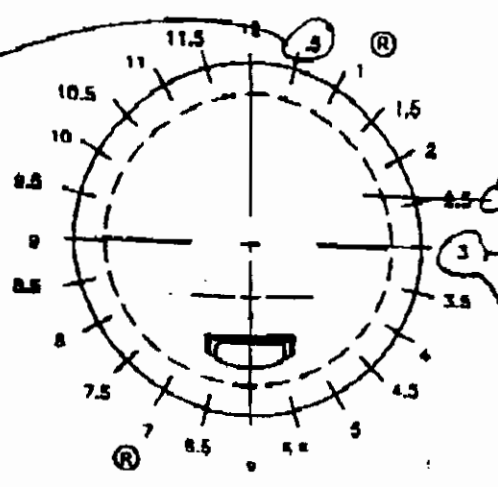
WEIGHTS:

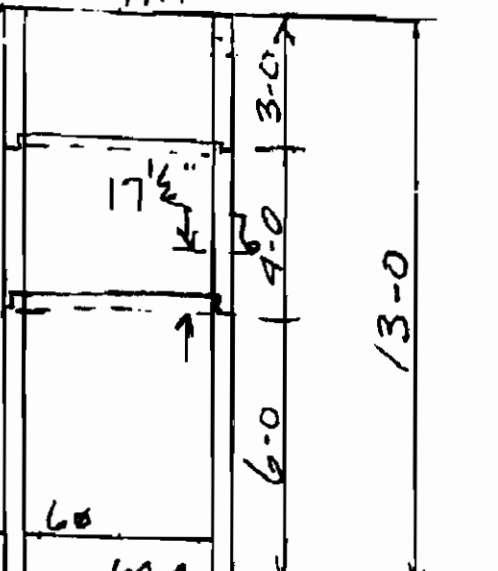
☐ A: SPECIFICATIONS:
CONCRETE: 4,000 P.S.I. @ 28 DAYS.
ENRAINED AIR: 5% - 8%.
STEEL: A.S.T.M. A496-A615
GRADE 60-60 KSI.
DESIGN LOADING: A-0.3/300PSF/WALKWAYS.
FLUTATION FORCES NOT ACCOUNTED FOR.

☒ B: SPECIFICATIONS:
CONCRETE: 4,000 P.S.I. @ 28 DAYS.
ENRAINED AIR: 5% - 8%.
STEEL: A.S.T.M. A496-A615
GRADE 60-60 KSI.
DESIGN LOADING: A.A.S.H.T.O. HS-20-44
WITH 30% IMPACT AND
EQUVALENT SOIL PRESSURE
OF 130 (PCF). FLUTATION
FORCES NOT ACCOUNTED FOR.

PROJECT: LANDFILL CLOSURE CONSTRUCTION
LOCATION: WHEATFIELD, NY
ENGINEER: CRA
CO: AIB HCWL ID/Status 55111
OFC. C. TOM SANTISERO Ph: 716-297-1550
FIELD CONT: Fax 716-297-5484
JOB FAX:
JOB MOBILE: JOB PGR:
SALESMAN 15-WJG P.O.#: TOM SANTISERO

	KOSTNER CONCRETE PRODUCTS INC. 8713 ROAD ROAD E. PEMBROKE, N.Y. 14056 (718) 894-2287	PRODUCT DESIGNATION MANHOLE TAKE-OFF FLAT TOP	DWG. NO. MH-MHTOFT © 12-26-83

6" HOPE EL. 69.37 BOOT RANGE _____ 11 hole 57 SUMP		2" HOPE EL. 72.10 BOOT RANGE _____ 20 K.O. ONLY 89 SUMP

EL. _____ BOOT RANGE _____ SUMP		6" HOPE EL. 68.90 BOOT RANGE _____ 11 hole 51 1/2 SUMP

EL. _____ BOOT RANGE _____ SUMP	77.4 17 1/2 6-0 4-0 3-0 13-0 6-0 6-0 6-0	EL. _____ BOOT RANGE _____ SUMP

RIM: 577.40 INV.: 564.90 DIFF.: 12.5 FIC & ADL. _____ INV. TO T.P. 12.5 SUMP: + .5 INV. TO T.P. 13.0	DOGHOUSE CENTERS HAVE ONLY BOTTOM STEPS OMITTED.	SHOP DWG FOR PIPE ALIGNMENT AND ELEVATION ONLY

UNIT NO.	WWC	STA. NO.	DIAMETER	60	LOT NO.

NOTE:	STANDARD BASE	FLANGED BASE	COATINGS		CASSETS RUBBER
			IN	OUT	
YES					
NO					

NOTE:	PRECAST STEP HOLES	MANHOLE STEPS		ROOF OPNG.	
		STANDARD	LONG	24"	SPECIAL
YES					
NO					

PROJECT: LANDFILL CLOSURE CONSTRUCTION

LOCATION: WHEATFIELD, NY

ENGINEER: CRA

CO: AIB-HCWL

OFC. C... TOM SANTISERO

FIELD CONT:

JOB PHONE:

JOB MOBILE:

SALESMAN 15-WJG

ID/Status 05111

Ph: 718-297-8484

Fax 718-297-8484

JOB FAX:

JOB PGR:

P.O. #: TOM SANTISERO



KISTNER CONCRETE
PRODUCTS INC.
8713 ROAD ROAD
E. PENNSBORO, N.Y.
14054
(716) 894-2287

PRODUCT DESIGNATION

MANHOLE TAKE-OFF FLAT TOP

DWG. NO.

MH-MHTOFT ©

12-20-85

EL. _____

BOOT
RANGE _____

SUMP

6" HDPE

EL. 568.68

BOOT
RANGE _____

9" hole

56 SUMP

EL. _____

BOOT
RANGE _____

SUMP

RIM: 577.86

INV.: 564.36

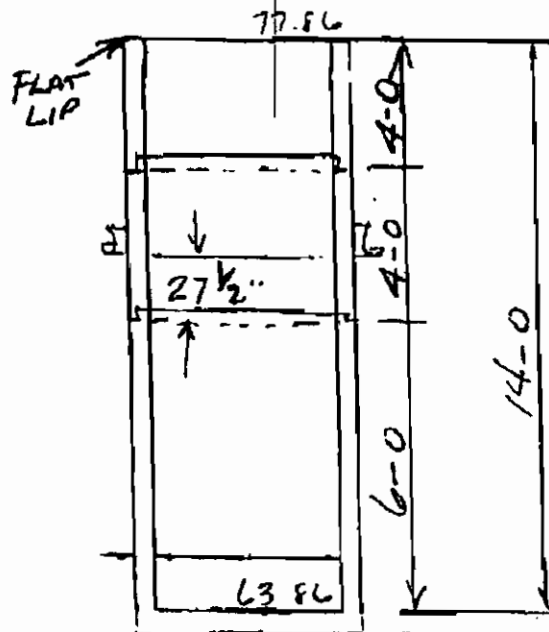
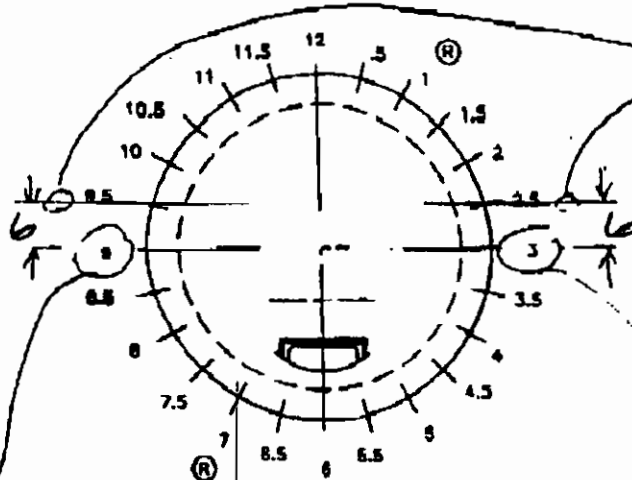
DIFF.: 13.5

FIG. & ADJ. _____

INV. TO T.P. 13.5

SUMP: + 5

WIS TO T.P. 14.0



DOGHOUSE CENTERS HAVE ONLY BOTTOM STEPS OMITTED.

2" FILE KNOCKOUT

EL. 72.37

BOOT
RANGE _____

20K ONLY

99 SUMP

6" HDPE

EL. 568.36

BOOT
RANGE _____

9 hole

52 1/2" SUMP

EL. _____

BOOT
RANGE _____

SUMP

SHOP DWG

FOR PIPE
ALIGNMENT

AND
ELEVATION

ONLY

UNIT NO. WWD

STA. NO.

DIAMETER

60

LOT NO.

NOTE:

STANDARD
BASE

FLANGED
BASE

COATINGS

GASKETS

YES

NO

NOTE

PRECAST STEP
HOLE

MANHOLE STEPS

ROOF OPNG.

YES

NO

PROJECT: LANDFILL CLOSURE CONSTRUCTION

LOCATION: WHEATFIELD, NY

ENGINEER: CRA

CO: A16-HCWL

ID/Status 06411

OFC.C.: TOM SANTISERO

Ph: 716-287-1250

FIELD CONT:

Fax 716-287-8484

JOB PHONE:

JOB FAX:

JOB MOBILE:

JOB PGR:

SALESMAN 15-WJG

P.O. #: TOM SANTISERO

SECTION M3
WET WELL PUMPS

JOHN W. DANFORTH COMPANY

Niagara County Refuse Site Wheatfield, New York JWD JOB #4368

15001 2.2A

- Wet Well Pumps

Contents:

2 pages	- cover sheet
4 pages	- Goulds submersible effluent pump Model 3885, applications, specifications, features, performance ratings, dimensions, Effluent ejector system
1 page	- cover sheet
5 pages	- Specification guiderail pump station, Dwg. PC20GR168, Goulds effluent and Sewage stainless steel slide rail systems

Supplied by:

Gehring Pumps

SUBMITTAL COVER

PARSONS ENGINEERING SCIENCE, INC. PROJECT NO. 733549.10100

CONTRACTOR: HASELEY CONSTRUCTION COMPANY, INC.

ADDRESS: 10315 LOCKPORT ROAD, NIAGARA FALLS, NY 14304

PROJECT: NIAGARA COUNTY REFUSE SITE SUBMITTAL NO: 47D

DATE OF SUBMITTAL: 01/28/99

TYPE OF SUBMITTAL (CHECK ONE)

☒ Product Data	☐ Schedule	☒ Performance Data
☐ Sample	☐ Warranty	☐ Operations & Maintenance Data
☐ Color Selection	☐ Test Report	☐ Record Document
☐		

DESCRIPTION OF SUBMITTAL:

Product Name: WET WELL PUMPS

Manufacturer: GOULDS PUMPS

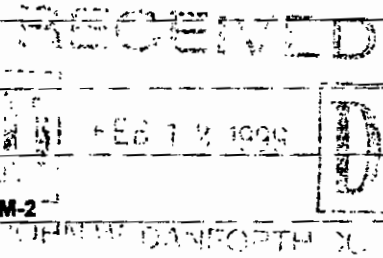
Subcontractor/Supplier: JOHN W. DANFORTH CO. / GEHRING PUMPS

Section No.(s): 15001

Drawing No.(s): M-2

Part/Paragraph: 2.2

Detail Reference:



ENGINEER'S APPROVAL

SUBMITTAL
FOR GENERAL REVIEW
WITH CONTRACT

DATE/BY
2-2-99 KD

FABRICATE
MAY PROCEED

FABRICATION/INSTALLATION
MAY NOT PROCEED

PARSONS ENGINEERING SCIENCE

CONTRACTOR'S APPROVAL STAMP

NIAGARA COUNTY REFUSE SITE
HASELEY CONSTRUCTION CO., INC.

Date: 1/28/99

Item: WET WELL PUMPS

Specification: MECHANICAL

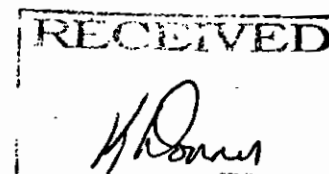
Section: 15001 Para. No. 2.2

Drawing No. M-2 Page No. 2

Location: N.C.R.S. Submittal No. 47D

APPROVED BY: WILLIAM L. BEY

RECEIVED STAMPS



JOHN W. DANFORTH COMPANY

PROJECT : Niagara County Refuse Site

JOB NO.: 4368

CUSTOMER PROJECT NO.: 9812

ENGINEER: Conestoga Rovers & Associates

DATE OF SUBMISSION: 1/21/99

PREVIOUS SUBMISSION: _____

CONTRACTOR: JOHN W. DANFORTH COMPANY

SUBCONTRACTOR: _____

SUPPLIER: Gehring Pumps

MANUFACTURER: Goulds Pumps

SPEC. SECTION: 15001 2.2A&B : Wet Well Pumps

DEVIATIONS NOTED: _____

4. 张某某，男，汉族，现年 30 岁，住本市 XX 路 XX 号。因患有严重疾病，经医院诊断，确属久病不治，生命垂危，特申请宣告死亡。



Submersible Effluent Pump

MODEL

3885

Wet Well
A & E

APPLICATIONS

Specifically designed for the following uses:

- Homes
- Farms
- Trailer courts
- Motels
- Schools
- Hospitals
- Industry
- Effluent systems

SPECIFICATIONS

Pump

- Solids handling capabilities: 3/4" maximum.
- Discharge size: 2" NPT.
- Capacities: up to 128 GPM.
- Total heads: up to 123 feet TDH.
- Mechanical seal: silicon carbide-rotary seat/silicon carbide-stationary seat, 300 series stainless steel metal parts, BUNA-N elastomers.
- Temperature: 104°F (40°C) continuous 140°F (60°C) intermittent.
- Fasteners: 300 series stainless steel.
- Capable of running dry without damage to components.

Motor

Single phase:

- 1/2 HP, 115 V/200 V, 230 V, 60 Hz, 1750 RPM; 1/2 HP, 115 V, 60 Hz, 3500 RPM; 1/2 HP - 1 1/2 HP, 230 V, 60 Hz, 3500 RPM.
- Built-in overload with automatic reset.
- Class B insulation.

Three phase:

- 1/2 HP - 1 1/2 HP - 200/230/460 V, 60 Hz, 3500 RPM.
- Class B insulation.

- Overload protection must be provided in starter unit.
- Shaft: threaded, 400 series stainless steel.
- Bearings: ball bearings upper and lower.
- Power cord: 20 foot standard length (optional lengths available).

Single phase:

- 1/2 and 1/2 HP - 16/3 SJTO with 175 V or 230 V three prong plug.
- 3/4 - 1 1/2 HP - 14/3 STO with bare leads.

Three phase:

- 1/2 - 1 1/2 HP - 14/4 STO with bare leads. On CSA listed models - 20 foot length SJTW and STW are standard.

FEATURES

- **Impeller:** Cast iron, semi-open, non-clog with pump-out vanes for mechanical seal protection. Balanced for

smooth operation. Silicon bronze impeller available as an option.

- **Casing:** Cast iron volute type for maximum efficiency. 2" NPT discharge adaptable for slide rail systems.

- **Mechanical Seal: SILICON CARBIDE VS. SILICON CARBIDE** sealing faces. Stainless steel metal parts, BUNA-N elastomers.

- **Shaft:** Corrosion-resistant stainless steel. Threaded design. Locknut on three phase models to guard against component damage on accidental reverse rotation.

- **Motor:** Fully submerged in high-grade turbine oil for lubrication and efficient heat transfer.

- **Designed for Continuous Operation:** Pump ratings are within the motor manufacturer's recommended working limits,

can be operated continuously without damage.

- **Bearings:** Upper and lower heavy duty ball bearing construction.

- **Power Cable:** Severe duty rated, oil and water resistant. Epoxy seal on motor end provides secondary moisture barrier in case of outer jacket damage and to prevent oil wicking.

- **O-ring:** Assures positive sealing against contaminants and oil leakage.

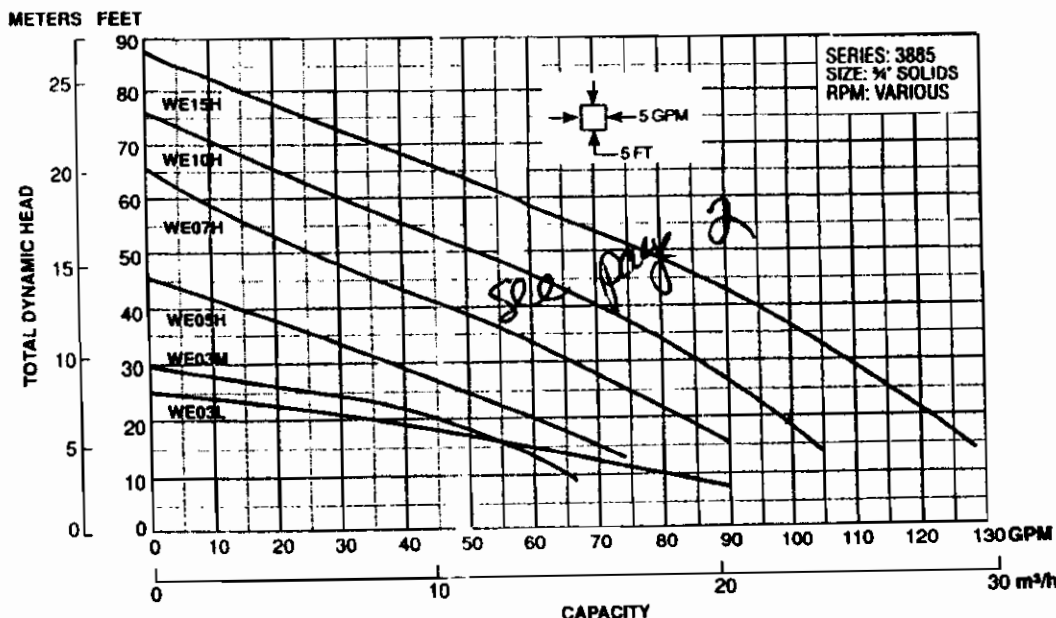
AGENCY LISTINGS



Canadian Standards Association

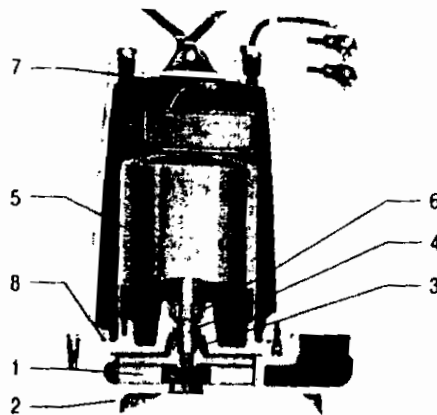


Underwriters Laboratories



PARTS

Item No.	Description
1	Impeller
2	Casing
3	Mechanical seal
4	Shaft
5	Motor
6	Bearings - upper and lower
7	Power cable
8	O-ring



Submersible Effluent Pump

MODEL

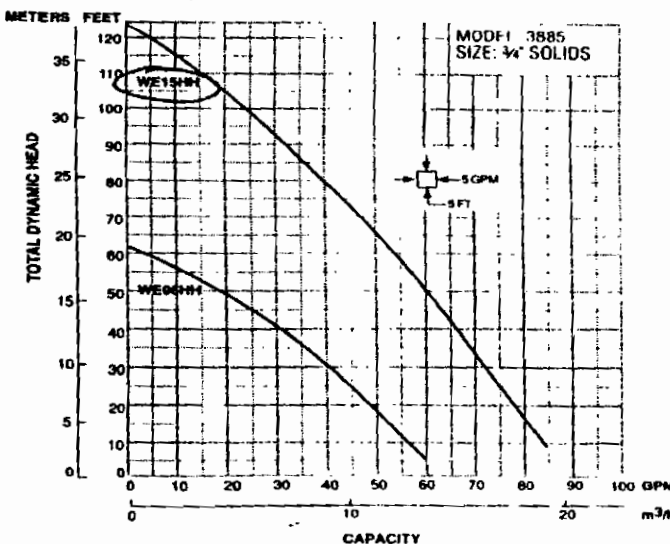
3885



MODELS

Order No.	HP	Volts*	Phase	Max. Amp.	RPM	3/8 Heater Size	Wt. (lbs.)
WE0311L	1/8	115		9.4	1750	N/A	56
WE0312L	1/8	230		4.7			
WE0318L	1/8	200		5.4			
WE0311M	1/8	115		9.4			
WE0312M	1/8	230		4.7			
WE0318M	1/8	200		5.4			
WE0511H	1/4	115		14.5			
WE0512H	1/4	230		7.3			
WE0518H	1/4	200		8.4			
WE0538H	1/4	200		3.9		K32	
WE0532H	1/4	230		3.4		K32	
WE0534H	1/4	460		1.7		K21	
WE0511HH	1/4	115		14.5			
WE0512HH	1/4	230		7.3		N/A	
WE0518HH	1/4	200		8.4			
WE0538HH	1/4	200		3.8		K32	
WE0532HH	1/4	230		3.3		K31	
WE0534HH	1/4	460		1.65		K21	
WE0712H	3/4	230		10.0			
WE0718H	3/4	200		11.5		N/A	
WE0738H	3/4	200		6.2		K49	
WE0732H	3/4	230		5.4		K39	
WE0734H	3/4	460		2.7		K28	
WE1012H	1	230		12.5		N/A	
WE1018H	1	200		14.4			
WE1038H	1	200		8.1		K43	
WE1032H	1	230		7.0		K43	
WE1034H	1	460		3.5		K32	
WE1512H	1 1/2	230		15.7		N/A	
WE1538H	1 1/2	200		10.6		K53	
WE1532H	1 1/2	230		9.2		K50	
WE1534H	1 1/2	460		4.6		K36	
WE1512HH	1 1/2	230		15.0		N/A	
WE1538HH	1 1/2	200		10.6		K53	
WE1532HH	1 1/2	230		9.2		K50	
WE1534HH	1 1/2	460		4.6		K36	

* For 575 V consult factory.



PERFORMANCE RATINGS (gallons per minute)

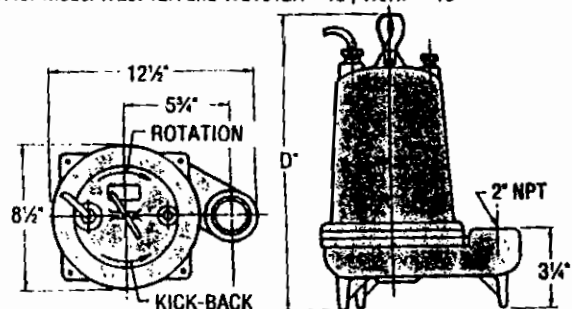
Order No.	WE0311L	WE0312L	WE0318L	WE0511H	WE0512H	WE0518H	WE0538H	WE0532H	WE0534H	WE0712H	WE0718H	WE0738H	WE0732H	WE0734H	WE1012H	WE1018H	WE1038H	WE1032H	WE1034H	WE1512H	WE1538H	WE1532H	WE1534H	WE1512HH	WE1538HH	WE1532HH	WE1534HH
HP	1/8	1/8	1/8	1/4	1/4	1/4	1/4	1/4	1/4	3/4	3/4	3/4	3/4	3/4	1	1	1	1	1	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2
RPM	1750	1750	1750	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500
Total Head Feet of Water	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110	115	120	125	130	135
	-	80	60	45	25	38	26	15	36	25	17	8			21	11											

DIMENSIONS

(All dimensions are in inches. Do not use for construction purposes.)

D* 1/4, 1/2, 3/4 and 1 HP = 15"

except for model WE0712H and WE1012H = 18"; 1 1/2 HP = 18"



EFFLUENT EJECTOR SYSTEM

Effluent ejector system offers ease of ordering and installation. A single ordering number specifies a complete system designed for most residential and commercial sump and effluent pump applications.



Package includes:

Submersible Effluent Pump WE0311L, 12L or WE0311M, 12M, WE0511HH, 12HH
Mechanical Level Control Switch A2-5 (115V), A2-6 (220V)
Basin A7-1801S, Basin Cover A8-1822
Check Valve A9-2P
Order No.: SWE0311L, SWE0312L, SWE0311M, SWE0312M, SWE0511HH, SWE0512HH.

GOULDS PUMPS, INC.
WATER TECHNOLOGIES GROUP
SENECA FALLS, NEW YORK 13148

SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.

PRINTED IN U.S.A.



Goulds Submersible Effluent Pump

MODEL

3885

Wet Well
B & D

APPLICATIONS

Specifically designed for the following uses:

- Homes
- Farms
- Trailer courts
- Motels
- Schools
- Hospitals
- Industry
- Effluent systems

SPECIFICATIONS

Pump

- Solids handling capabilities: 3/4" maximum.
- Discharge size: 2" NPT.
- Capacities: up to 128 GPM.
- Total heads: up to 123 feet TDH.
- Mechanical seal: silicon carbide-rotary seat/silicon carbide-stationary seat, 300 series stainless steel metal parts, BUNA-N elastomers.
- Temperature: 104°F (40°C) continuous 140°F (60°C) intermittent.
- Fasteners: 300 series stainless steel.
- Capable of running dry without damage to components.

Motor

Single phase:

- 1/4 HP, 115 V, 200 V, 230 V, 60 Hz, 1750 RPM; 1/2 HP, 115 V, 60 Hz, 3500 RPM; 1/2 HP - 1 1/2 HP, 230 V, 60 Hz, 3500 RPM.
- Built-in overload with automatic reset.
- Class B insulation.

Three phase:

- 1/2 HP - 1 1/2 HP 200/230/460 V, 60 Hz, 3500 RPM.
- Class B insulation.

- Overload protection must be provided in starter unit.
- Shaft: threaded, 400 series stainless steel.
- Bearings: ball bearings upper and lower.
- Power cord: 20 foot standard length (optional lengths available).

Single phase:

- 1/4 and 1/2 HP - 16/3 SJTO with 115 V or 230 V three prong plug.
- 1/2-1 1/2 HP - 14/3 STO with bare leads.

Three phase:

- 1/2-1 1/2 HP - 14/4 STO with bare leads. On CSA listed models - 20 foot length SJTW and STW are standard.

FEATURES

- **Impeller:** Cast iron, semi-open, non-clog with pump-out vanes for mechanical seal protection. Balanced for

smooth operation. Silicon bronze impeller available as an option.

■ **Casing:** Cast iron volute type for maximum efficiency. 2" NPT discharge adaptable for slide rail systems.

■ **Mechanical Seal: SILICON CARBIDE VS. SILICON CARBIDE** sealing faces. Stainless steel metal parts, BUNA-N elastomers.

■ **Shaft:** Corrosion-resistant stainless steel. Threaded design. Locknut on three phase models to guard against component damage on accidental reverse rotation.

■ **Motor:** Fully submerged in high-grade turbine oil for lubrication and efficient heat transfer.

■ **Designed for Continuous Operation:** Pump ratings are within the motor manufacturer's recommended working limits,

can be operated continuously without damage.

■ **Bearings:** Upper and lower heavy duty ball bearing construction.

■ **Power Cable:** Severe duty rated, oil and water resistant. Epoxy seal on motor end provides secondary moisture barrier in case of outer jacket damage and to prevent oil wicking.

■ **O-ring:** Assures positive sealing against contaminants and oil leakage.

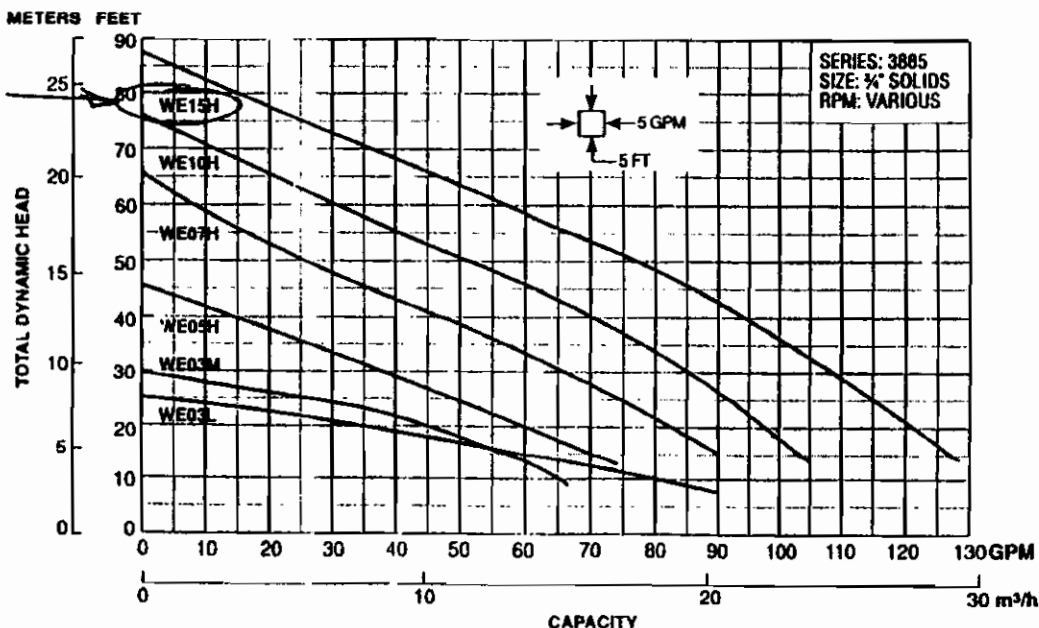
AGENCY LISTINGS



Canadian Standards Association

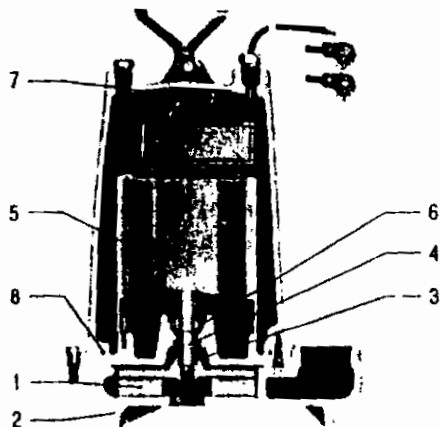


Underwriters Laboratories



PARTS

Item No.	Description
1	Impeller
2	Casing
3	Mechanical seal
4	Shaft
5	Motor
6	Bearings - upper and lower
7	Power cable
8	O-ring



GOULDS

Submersible Effluent Pump

MODEL

3885

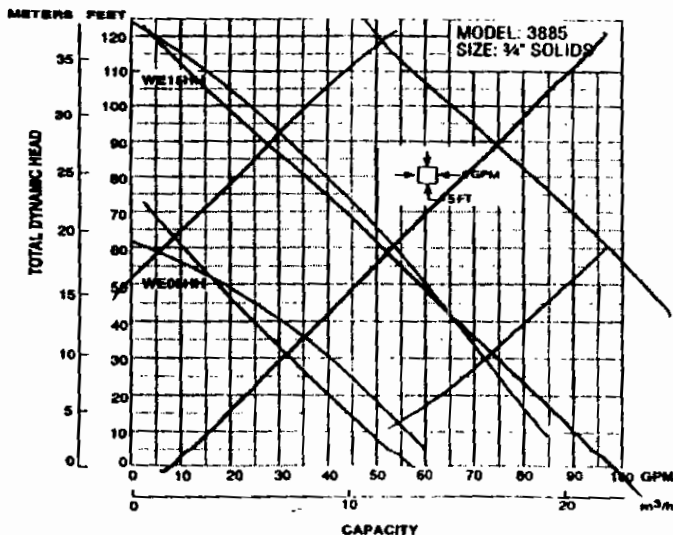
Wet Well
B & D



MODELS

Order No.	HP	Volts*	Phase	Max. Amp.	RPM	3ø Heater Size	Wt. (lbs.)
WE0311L	1/5	115		9.4	1750		56
WE0312L		230		4.7			
WE0318L		200		5.4			
WE0311M	1/5	115		9.4			
WE0312M		230		4.7			
WE0318M		200		5.4			
WE0511H	1/2	115		14.5			
WE0512H		230		7.3			
WE0518H		200		8.4			
WE0538H		200		3.9		K32	
WE0532H	1/2	230	3	3.4		K32	
WE0534H		460		1.7		K21	
WE0511H	1/2	115		14.5			
WE0512H		230		7.3			
WE0518H		200		8.4			
WE0538H		200		3.8		K32	
WE0532H	1/2	230	3	3.3		K31	
WE0534H		460		1.65		K21	
WE0712H	3/4	230	1	10.0			
WE0718H		200		11.5			
WE0738H	3/4	200		6.2		K49	
WE0732H		230	3	5.4		K39	
WE0734H		460		2.7		K28	
WE1012H	1	230	1	12.5			
WE1018H		200		14.4			
WE1038H	1	200		8.1		K43	
WE1032H		230	3	7.0		K43	
WE1034H		460		3.5		K32	
WE1512H	1 1/2	230	1	15.7			
WE1538H		200		10.6		K53	
WE1532H	1 1/2	230	3	9.2		K50	
WE1534H		460		4.6		K36	
WE1512H	1 1/2	230	1	15.0			
WE1538H		200		10.6		K53	
WE1532H	1 1/2	230	3	9.2		K50	
WE1534H		460		4.6		K36	

* For 575 V consult factory.



PERFORMANCE RATINGS (gallons per minute)

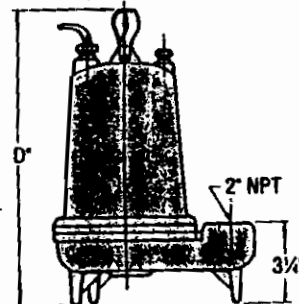
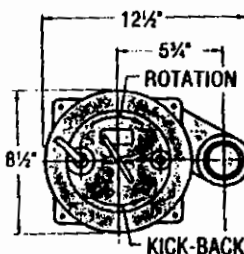
Order No.	WE0311L WE0312L WE0318L	WE0311M WE0312M WE0318M	WE0511H WE0512H WE0518H	WE0712H WE0738H WE0710H	WE1012H WE1038H WE1010H	WE1512H WE1538H WE1534H	WE0511H WE0512H WE0518H	WE1512H WE1538H WE1534H
HP	1/5	1/5	1/2	3/4	1	1 1/2	1/2	1 1/2
RPM	1750	1750	3500	3500	3500	3500	3500	3500
Total Head Feet of Water								
5	-	-	-	-	-	-	60	-
10	80	65	-	-	-	-	56	84
15	60	57	69	90	104	128	53	82
20	36	45	60	83	98	122	48	77
25	-	25	50	76	92	116	45	75
30	-	-	38	67	85	109	40	72
35	-	-	26	58	78	102	35	70
40	-	-	15	47	70	94	30	67
45	-	-	-	36	62	86	25	64
50	-	-	-	25	52	77	18	60
55	-	-	-	17	42	67	12	58
60	-	-	-	8	32	56	3	54
65	-	-	-	-	21	46	-	51
70	-	-	-	-	11	35	-	47
75	-	-	-	-	-	25	-	43
80	-	-	-	-	-	15	-	40
90	-	-	-	-	-	-	-	33
100	-	-	-	-	-	-	-	24
110	-	-	-	-	-	-	-	15
120	-	-	-	-	-	-	-	5

DIMENSIONS

(All dimensions are in inches. Do not use for construction purposes.)

D* 1/2, 1/2, 1/2 and 1 HP = 15"

except for model WE0712H and WE1012H = 18"; 1 1/2 HP = 18"



EFFLUENT EJECTOR SYSTEM

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Package Includes:

Submersible Effluent Pump WE0311L, 12L or WE0311M, 12M, WE0511H, 12H
Mechanical Level Control Switch A2-5 (115V), A2-6 (230V)
Basin A7-1801S, Basin Cover A8-1822
Check Valve A9-2P
Order No.: SWE0311L, SWE0312L, SWE0311M, SWE0312M, SWE0511H, SWE0512H.

GOULDS PUMPS, INC.
WATER TECHNOLOGIES GROUP
SENECA FALLS, NEW YORK 13148

SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.

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SUBMITTAL COVER

PARSONS ENGINEERING SCIENCE, INC. PROJECT NO.

733649.10100

CONTRACTOR:

HASELEY CONSTRUCTION COMPANY, INC.

ADDRESS:

10315 LOCKPORT ROAD, NIAGARA FALLS, NY 14304

PROJECT:

NIAGARA COUNTY REFUSE SITE

SUBMITTAL NO:

47E

DATE OF SUBMITTAL:

01/28/99

TYPE OF SUBMITTAL (CHECK ONE)



Product Data



Schedule



Performance Data



Sample



Warranty



Operations & Maintenance Data



Color Selection



Test Report



Record Document



SHOP DRAWINGS

DESCRIPTION OF SUBMITTAL:

Product Name:

GUIDE RAIL PUMP DISCONNECT SYSTEM (AS EQUAL)

Manufacturer:

PUMPCON INTERNATIONAL INC.

Subcontractor/Supplier:

JOHN W. DANFORTH CO.

Section No.(s):

15001

Drawing No.(s):

M-2

Part/Paragraph:

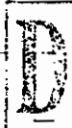
2.7

Detail Reference:

JOHN W. DANFORTH CO.

RECEIVED

FEB 12 1999



ENGINEER'S APPROVAL

CONTRACTOR'S APPROVAL STAMP

SUBMITTAL COVER	
FOR GENERAL CONTRACTOR USE	
WITH COMMENTS	
DATE	BY
2-9-99	KD
FABRICATION	
MAY NOT PROCEED	
PARSONS ENGINEERING SCIENCE	

NIAGARA COUNTY REFUSE SITE
HASELEY CONSTRUCTION CO., INC.

Date: 1/28/99

Item: Pump Guide Rail

Specification: Mechanical

Section: 5001 Para. No. 2.7

Drawing No. M-2 Page No. 3

Location: NCC Submittal No. 47E

APPROVED BY: WILLIAM L. BEY

RECEIVED STAMPS

RECEIVED
BY: K. Donner

SPECIFICATION

GUIDERAIL PUMP STATION

GENERAL

The guiderail pump station shall be as described in these specifications and accompanying drawings, and shall consist of (but not be limited to), the following:

- Guiderail Assemblies
- Pump Bracket Assemblies
- Lifting Cable Assemblies
- Discharge Piping Assembly

Station shall be as manufactured by PumpCon International, Inc. of Conway, Arkansas.

GUIDERAIL ASSEMBLY

The guiderail assembly shall be constructed of type 304 stainless steel and shall consist of a minimum of two rails, a bottom base plate, a minimum of one cross brace every 18 inches between the rails and a wall brace all welded together to provide the maximum structural integrity. The rails shall be round to provide a non-binding surface during installation and removal of the pump. The guiderail assembly shall be installed as a one-piece unit and shall be bolted to the basin bottom and the basin wall a minimum of two places each.

PUMP BRACKET ASSEMBLY

The pump bracket assembly shall consist of a top bracket and a bottom bracket. The brackets shall be fabricated of 3/16" type 304 stainless steel material. The top bracket shall be attached to the discharge piping above the pump disconnect and shall be constructed in such a manner that the pump cannot be removed from the guiderail assembly except when removing pump out the top of the sump basin. The bottom bracket shall be attached to the pump at the discharge connection and shall guide the pump along the guiderail assembly to insure proper alignment of the pump.

LIFTING CABLE ASSEMBLY

A 3/16" (7 x 9) stainless steel lifting cable shall be furnished for lifting and lowering the pump in the sump basin. The stainless steel lifting cable shall be of the 18-8 type 316 stainless steel and shall have minimum nominal breaking strength of 15 times the weight of the pump. It shall be substantially attached to the top of the pump and shall have a formed loop at the other end.

DISCHARGE HEADER

The discharge piping shall include a cast iron ball check valve, with a natural rubber ball and clean out port with plug for easy access, a brass quick disconnect fitting, and an o-ring stem brass gate valve with a stainless steel handle, per pump. All other piping shall be schedule 40 galvanized malleable iron.

GATE VALVE EXTENSION HANDLE

The station shall have a gate valve extension handle per valve, which will allow the gate valve to be operated from a maximum of 6" below the basin cover. The handle shall be constructed of a minimum of 3/8" diameter type 304 stainless steel. The handle shall be held in place by being attached to the gate valve and by the guiderail wall brace.

PAINTING

All internal metal parts that are not brass, galvanized steel, or stainless steel shall be painted with coal-tar epoxy paint to resist corrosion, unless otherwise noted.

GUARANTEE

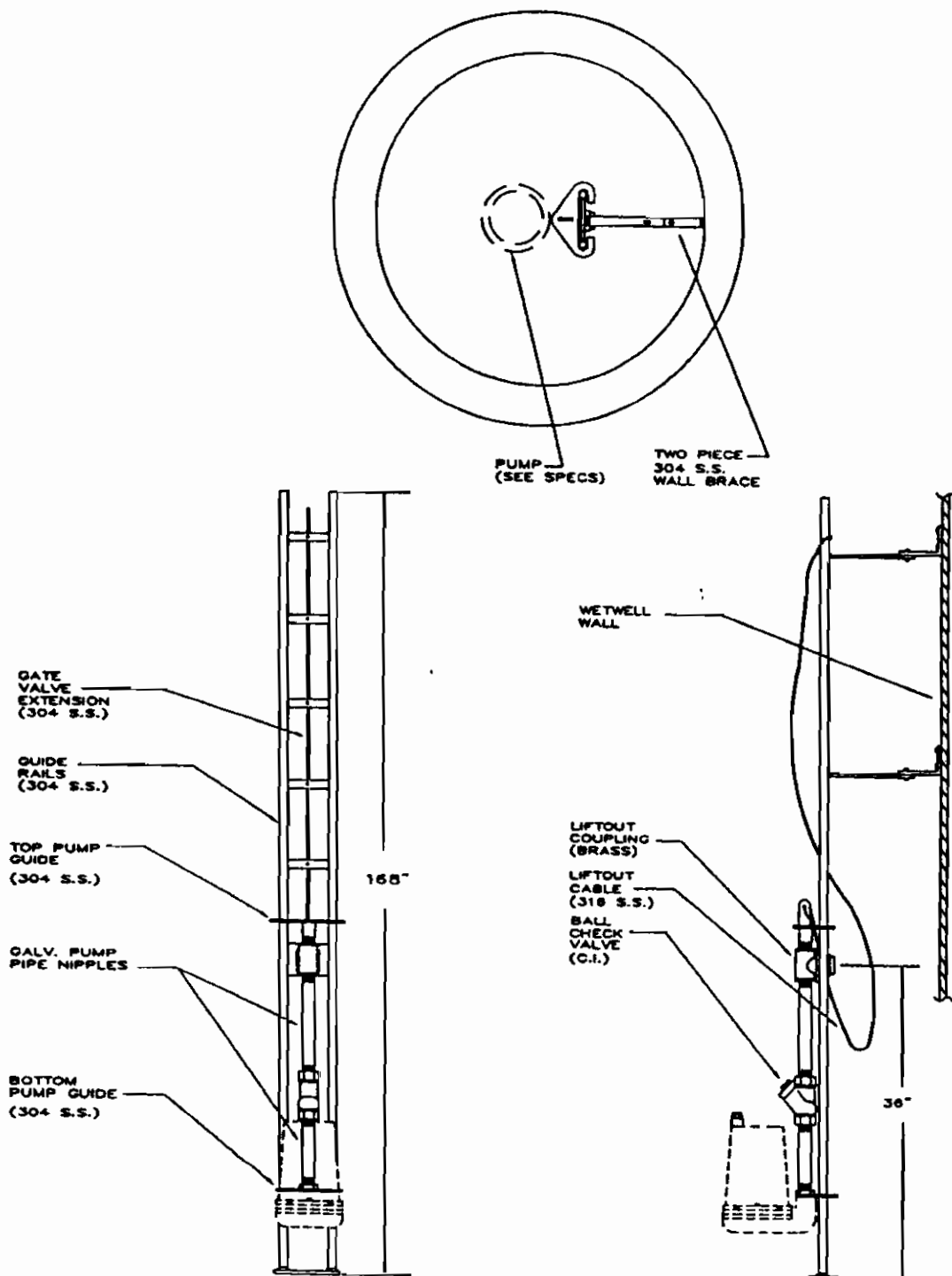
The manufacturer of the lift station shall furnish a limited warranty for 18 months from the date of shipment or 12 months from start-up (whichever occurs first), that all equipment shall be free from defects in design, materials and workmanship. The lift station manufacturer shall furnish replacement parts for any component proven defective, whether of his or other manufacturer during the warranty period, excepting only those items which are normally consumed in service, such as (but not limited to) light bulbs, oil, grease, packing, etc.

PACKAGING AND MARKING

Installation instructions shall be furnished with the station.

WORKMANSHIP AND EXPERIENCE

All workmanship and materials throughout shall be of the highest quality. The station shall be the product of a supplier who has been actively engaged in research, development and has supplied proven field installations of complete sewage pumping systems for not less than five (5) years. A list of ten (10) separate sewage pumping systems shall be provided upon request.



PUMPCON
INTERNATIONAL INC.
 P.O. Box 909 • Conway, AR. 72033
 (501) 336-8500

TITLE: PC20GR168
 PROJECT:
 CUSTOMER: GEHRING PUMP

JOB NO:
 P.O. NO: 90016A
 DWG. NO: PC20GR168

DATE: 01-13-99
 REVISED:
 REVISED:
 PCI USE: HBJ

REQUEST FOR INFORMATION

Contractor: HASELEY CONSTRUCTION CORP. Date: 2/2/99 RFI No.: 15
Subject: PUMP GUIDE RAIL DISCONNECT SYSTEM

Project: NIAGARA COUNTY REFUSE
Drawing Sheet: M-2 Drawing Description: _____

Division: _____ Section: _____
No. Title No. Title

Est. Cost Impact: _____ Est. Schedule Impact: _____

Prepared by: K. DONNER Request Response By: 2/9/99
M D Y

Written description of Request - Attach sketches as required:
IS LIFTOUT COUPLING SAME AS FOOT DISCONNECT

Contractor's Solution: _____

Engineer's Response: Approved as submitted (assumes match with Goulds pump specified)

By: [Signature] Date: 2/9/99
M D Y

Distribution:
Contractor HASELEY
Resident Engineer J GWE
Project Manager J KYLES
Technical Manager R POPE
CLEAN SITES

RECEIVED
FEB 09 1999
BY: [Signature]

Post-It™ Fax Note	7671E	Date	# of pages
To <i>Rick Horvath</i>	From <i>P. Bauman</i>		
Co./Dept. <i>NF</i>	Co. <i>W'400</i>		
Phone #	Phone #		
Fax # <i>50004</i>	Fax #		

Effluent and Sewage

Stainless Steel Slide Rail Systems

1½" AND 2" DISCHARGE SLIDE RAIL SYSTEMS

Provides easy means of removing pump from wet-well by utilizing a quick disconnect and guide assembly. Eliminates need to enter wet-well.

Corrosion resistant design includes: Stainless steel rails, Cross brace, Quick disconnect plate, Base plate, Lift cable, Bronze quick disconnect.

Adaptable to all 1½" and 2" NPT vertical discharge effluent and sewage pumps.

Designed for use with horizontal discharge systems.

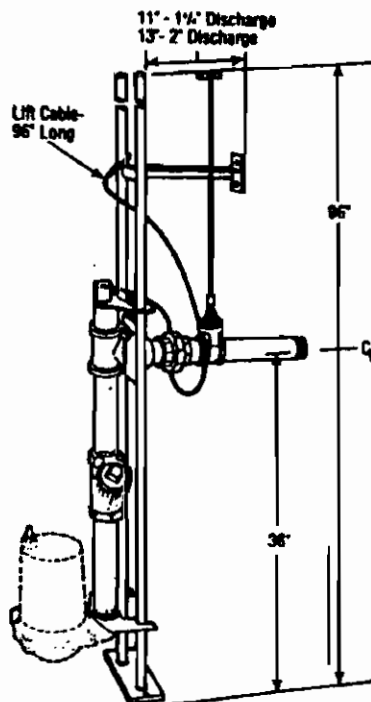
BASIC SLIDE RAIL ASSEMBLY INCLUDES:

- 96" Long guide rails (SS)
- Wall bracket (SS)
- Top pump bracket
- Quick disconnect adapter (bronze)
- Bottom pump bracket
- Base plate (SS)
- Lifting cable (SS)
- Check valve
- Vertical pipe nipples - galvanized
- Tee handle(s)

NOTE: Standard overall length of piping is 96" ... can be cut down to 48" minimum length. If rail length longer than 96" is needed, see pricing schedule.



SIMPLEX

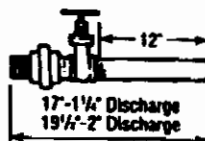


Simplex system consists of:

- 1-Slide rail
- 1-Simplex discharge piping

Simplex Discharge Piping:

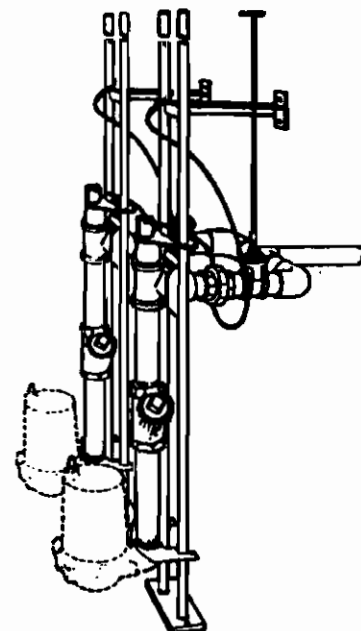
H12S, 1½"
H20S, 2"



Simplex includes:

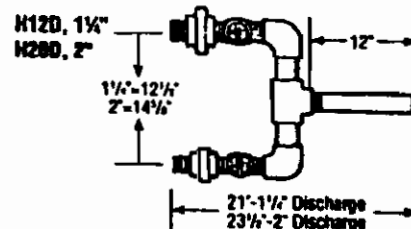
- Union
- Pipe nipples

DUPLEX



Duplex system consists of:
2-Slide rails
1-Duplex discharge piping

Duplex Discharge Piping:



Duplex includes:

- Pipe nipples
- Gate valves
- Unions
- Pipe tee

Ordering Information	For Use With Pump Model	Simplex System			
		Size	Qty.	Order No.	Description
	RG2012 ▶	1½"	1	A10-12	Slide Rail
			1	H12S	Disch. Piping
	3885 ▶	2"	1	A10-20	Slide Rail
	3886 ▶		1	H20S	Disch. Piping
	3887 ▶		1		

Duplex System				
Size	Qty.	Order No.	Description	
1½"	2	A10-12	Slide Rail	
	1	H12D	Disch. Piping	
2"	2	A10-20	Slide Rail	
	1	H20D	Disch. Piping	

CRA

2055 Niagara Falls Blvd., Suite Three
Niagara Falls, NY 14304

(716) 297-2160 Office (716) 297-2265 Fax

DATE: Feb 9/99
PROJECT NUMBER: 5723
PROJECT NAME: NCR

TRANSMITTAL TO:

Jim Cowe
Persons
NCR Site
trailers

Please find: ☐ Draft ☐ Final
☐ Originals ☒ Other RFIs
☐ Prints

Sent via: ☐ Mail ☒ Same Day Courier
☐ Overnight Courier ☐ Other

QUANTITY	DESCRIPTION
<u>1</u>	<u>RFI #12</u>
<u>1</u>	<u>RFI #13</u>
<u>1</u>	<u>RFI #14</u>
<u>1</u>	<u>RFI #15</u>

RECEIVED
FEB 9 1999
BY: W. Danner

☐ As Requested ☐ For Review and Comment
☐ For Your Use ☒ Approved as submitted
☐ For Review ☐

COMMENTS:

I've attached the cut sheet for the
Gould slide rail system for
comparison. Will still need duplex system

Copy to: _____ Signed: CRN

Filing: Correspondence File

SECTION M4

VALVES

JOHN W. DANFORTH COMPANY

Niagara County Refuse Site
Wheatfield, New York
JWD JOB #4368

15001 2.3A - Check Valves

Contents:

2 page - cover sheet

1 page - BCV Series Cast iron ball check valves,
description / features, specifications

Supplied by Gehring Pumps

SUBMITTAL COVER

PARSONS ENGINEERING SCIENCE, INC. PROJECT NO.

733549.10100

CONTRACTOR:

HASELEY CONSTRUCTION COMPANY, INC.

ADDRESS:

10315 LOCKPORT ROAD, NIAGARA FALLS, NY 14304

PROJECT:

NIAGARA COUNTY REFUSE SITE

SUBMITTAL NO:

47F

DATE OF SUBMITTAL:

01/28/99

TYPE OF SUBMITTAL (CHECK ONE)



Product Data



Schedule



Performance Data



Sample



Warranty



Operations & Maintenance Data



Color Selection



Test Report



Record Document



SHOP DRAWINGS

DESCRIPTION OF SUBMITTAL:

Product Name:

CHECK VALVES

Manufacturer:

PUMPCON INTERNATIONAL INC.

Subcontractor/Supplier:

JOHN W. DANFORTH CO.

Section No.(s):

15001

Drawing No.(s):

M-2

Part/Paragraph:

2.3

Detail Reference:

JOHN W. DANFORTH

ENGINEER'S APPROVAL

CONTRACTOR'S APPROVAL STAMP

22-99 KD

NIAGARA COUNTY REFUSE SITE
HASELEY CONSTRUCTION CO., INC.

Date: 1/28/99

Item: CHECK VALVES

Specification: MECHANICAL

Section: 15001 Para. No. 2.3

Drawing No.: M-2 Page No. 2

Location: HCS. Submittal No. 47F

APPROVED BY: WILLIAM L. BEY

RECEIVED STAMPS

ED

KDover

JOHN W. DANFORTH COMPANY

PROJECT : Niagara County Refuse Site

JOB NO.: 4368

CUSTOMER PROJECT NO.: 9812

ENGINEER: Conestoga Rovers & Associates

DATE OF SUBMISSION: 1/21/99

PREVIOUS SUBMISSION: _____

CONTRACTOR: JOHN W. DANFORTH COMPANY

SUBCONTRACTOR: _____

SUPPLIER: Gehring Pumps

MANUFACTURER: Pumpcon International Inc

SPEC. SECTION: 15001 2.3A : Check Valves

DEVIATIONS NOTED: _____

RECEIVED

1/21/99

1/21/99

1/21/99

1/21/99

CAST IRON BALL CHECK VALVES

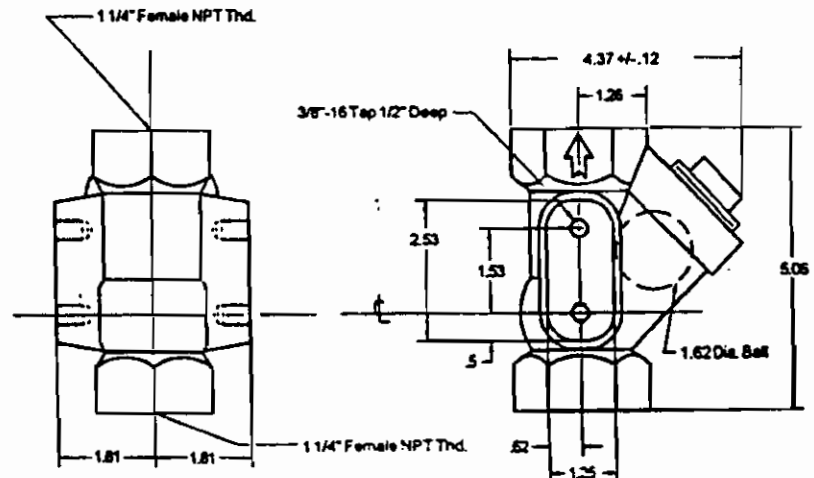


SPECIFICATIONS

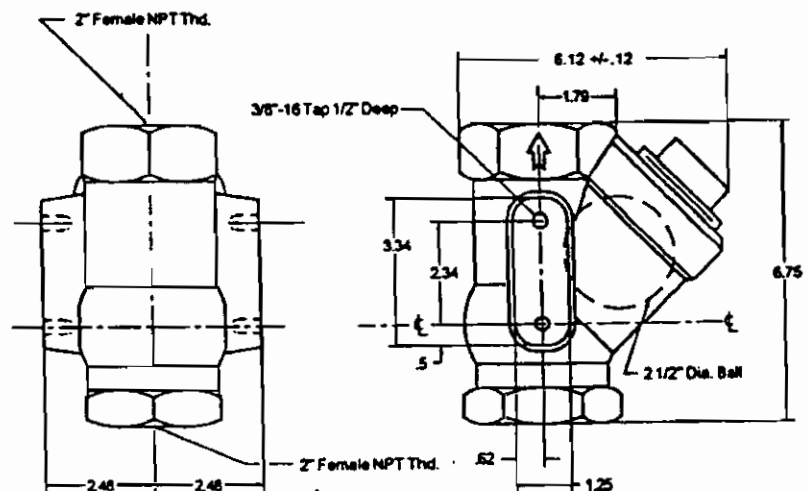
	BCV-1	BCV-2
Pipe Connection Size:	1 1/4" Female NPT	2" Female NPT
Materials of Construction:		
Valve Body;	Cast Iron	Cast Iron
Inspection Plug;	Cast Iron	Cast Iron
Ball;	BUNA N	BUNA N
Maximum Temperature:	180° F (82° C)	180° F (82° C)
Maximum Pressure:	150 psi	150 psi
Minimum Operating Pressure: (Valve Mounted Horizontally)	7.35 psi (17ft)	7.35 psi (17ft)

DESCRIPTION/FEATURES

- The Model BCV series valve are Non-clog Ball Check Valves for use with sewage, effluent, and many other viscous liquids that may contain solids.
- A threaded inspection port is provided for ease of cleaning and ball replacement.
- The valve will operate properly when installed in either a vertical or horizontal position - See specifications for operating pressure requirements.
- Corrosion resistance is provided by use of a one piece cast iron valve body, cast iron inspection port plug, and a BUNA N ball.
- 3/8"-16 tapped bolt provisions, mounted on a large flat boss on each side of the valve body makes the valve adaptable to many different designs of pump guide rail systems, etc.



BCV - 1



BCV - 2



SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

JOHN W. DANFORTH COMPANY

Niagara County Refuse Site
Wheatfield, New York
JWD JOB #4368

15001 2.4A - Ball Valves

Contents:

2 pages - cover sheet

A-8 - Apollo 76-100 Series stainless steel ball
valve features, standard material list, options
available

Supplied by: IDS Lakes Pipe & Supply Co., Inc.

SUBMITTAL COVER

PARSONS ENGINEERING SCIENCE, INC. PROJECT NO. 733649.10100

CONTRACTOR: HASELEY CONSTRUCTION COMPANY, INC.

ADDRESS: 10315 LOCKPORT ROAD, NIAGARA FALLS, NY 14304

PROJECT: NIAGARA COUNTY REFUSE SITE

SUBMITTAL NO: 47 *B*

DATE OF SUBMITTAL: 01/18/99

TYPE OF SUBMITTAL (CHECK ONE)

☒ Product Data	☐ Schedule	☐ Performance Data
☐ Sample	☐ Warranty	☐ Operations & Maintenance Data
☐ Color Selection	☐ Test Report	☐ Record Document
☐		

DESCRIPTION OF SUBMITTAL:

Product Name: STAINLESS STEEL BALL VALVE

Manufacturer: APOLLO

Subcontractor/Supplier: JOHN W. DANFORTH COMPANY

Section No.(s): 15001

Drawing No.(s): M-2

Part/Paragraph: 2.4

Detail Reference:

ENGINEER'S APPROVAL

SUBMITTAL REVIEW
FOR GENERAL COMPLIANCE
WITH CONTRACT DOCUMENTS

DATE/BY

1-19-99 REVIEWED

REVIEWED AS NOTED

FABRICATION/INSTALLATION/PRODUCTION
MAY PROCEED.

REVIEW AND RESUBMIT

REJECTED

FABRICATION/INSTALLATION/PRODUCTION
MAY NOT PROCEED.

PARSONS ENGINEERING SCIENCE

CONTRACTOR'S APPROVAL STAMP

NIAGARA COUNTY REFUSE SITE
HASELEY CONSTRUCTION CO., INC.

Date: 1/18/99

Item: BALL VALVES

Specification: MECHANICAL

Section: 15001 Para. No. 2.4

Drawing No.: M-2 Page No. 3

Location: N.E.S. S. 47

APPROVED BY: W. L. BEY

RECEIVED STAMPS

RECEIVED

W. L. Bey

JOHN W. DANFORTH COMPANY

PROJECT : Niagara County Refuse Site

JOB NO.: 4368

CUSTOMER PROJECT NO.: 9812

ENGINEER: Conestoga Rovers & Associates

DATE OF SUBMISSION: 1/12/99

PREVIOUS SUBMISSION: _____

CONTRACTOR: JOHN W. DANFORTH COMPANY

SUBCONTRACTOR: _____

SUPPLIER: IDS Lakes Pipe & Supply Co., Inc

MANUFACTURER: Apollo Model 76-100

SPEC. SECTION: 15001 2.4A - Ball Valves

DEVIATIONS NOTED: _____

Apollo® 76-100 Series

Stainless Steel Ball Valve

Threaded, 1/4" to 1" 2000 psig WOG, 1-1/4" to 2" 1500 psig WOG, 2-1/2" to 3" 1000 psig WOG
Cold Non-Shock. 150 psig Saturated Steam, Vacuum Service to 29 inches Hg.
Federal Specification: WW-V-35C, Type: II, Composition: SS, Style: 3.

FEATURES

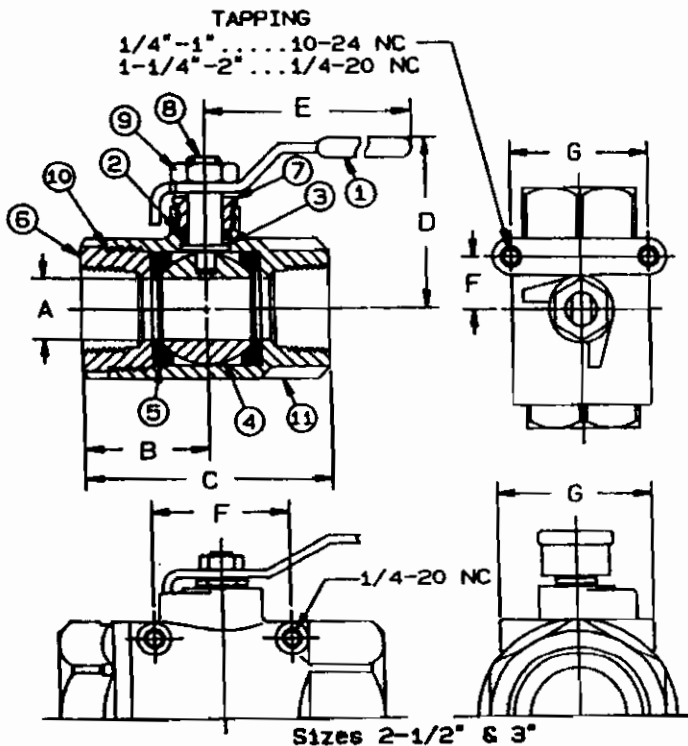
- Investment cast components
- RPTFE seats and stuffing box ring
- Mounting pad for easy actuator mounting
- Blow-out-proof stem design
- Adjustable packing gland
- Meets NACE MR-01-75
- SS lever and nut
- (-24) 1/4" to 2" Certified to API 607, 4th Edition, Class 600 burn

STANDARD MATERIAL LIST

1. Lever and grip	304 SS w/vinyl	7. Gland nut	A276-316
2. Stem packing	RPTFE	8. Stem	A276-316
3. Stem bearing	RPTFE	9. Lever nut	18-8 SS
4. Ball	A276-316	10. Body seal	PTFE
5. Seat (2)	RPTFE	(1-1/4" to 3")	
6. Retainer	A276-316 (1/4" to 1")	11. Body	A351-CF8M
	A351-CF8M (1-1/4" to 3")		

OPTIONS AVAILABLE:

(SUFFIX)	OPTION	SIZES
-02-	Static Grounded	1/4" to 3"
-03-	1-1/4" Stem Extension	1/4" to 3"
-04-	2-1/4" Stem Extension	1/4" to 3"
-07-	Tee Handle	1/4" to 2"
-08-	90° Reversed Stem	1/4" to 3"
-14-	Vented Ball	1/4" to 2"
-15-	Round Handle	1/4" to 2"
-16-	Vertical Chain Lever	3/4" to 2"
-19-	Lock Plate	1/4" to 2"
-21-	UHMWPE Seats (Non-PTFE)	1/4" to 3"
-24-	Graphite Stem Packing	1/4" to 3"
-27-	Latch Lock Lever	1/4" to 3"
-30-	CamLock Handle	1/4" to 2"
-32-	SS Tee Handle & Nut	1/4" to 2"
-35-	PTFE Trim	1/4" to 3"
-36-	SS Hi-Rise Round Handle & Nut	1/4" to 2"
-39-	SS Latch Lock Wheel Handle	1/4" to 2"
-40-	Cyl-Loc	1/4" to 2"
-44-	Seat Welded	1/4" to 2"
-45-	Less Lever & Nut	1/4" to 3"
-46-	Latch Lock Lever - Lock Close Only	1/4" to 3"
-47-	SS Latch Lock Oval Handle	1/4" to 1"
-48-	SS Oval Handle	1/4" to 2"
-49-	Assembled Dry	1/4" to 3"
-50-	2-1/4" Locking Stem Extension	1/4" to 3"
-57-	Cleaned For Gaseous Oxygen	1/4" to 3"
-58-	Horizontal Chain Lever	3/4" to 2"
-60-	Static Grounded Ball & Stem	1/4" to 3"
-64-	250 Lb. Steam Trim	1/4" to 3"
-P01-	BSPP (Parallel) Thread Connection	1/4" to 3"
-T01-	BSPT (Tapered) Thread Connection	1/4" to 3"



STAINLESS STEEL BALL VALVE

NUMBER	SIZE	A	B	C	D	E	F	G	Wt.
76-101-01	1/4"	.37	1.03	2.06	1.75	3.87	.50	1.12	.58
76-102-01	3/8"	.37	1.03	2.06	1.75	3.87	.50	1.12	.54
76-103-01	1/2"	.50	1.12	2.25	1.81	3.87	.50	1.12	.63
76-104-01	3/4"	.68	1.50	3.00	2.12	4.87	.87	1.37	1.27
76-105-01	1"	.87	1.68	3.37	2.25	4.87	.87	1.37	1.63
76-106-01	1-1/4"	1.00	2.00	4.00	2.62	5.50	.93	1.50	3.06
76-107-01	1-1/2"	1.25	2.18	4.37	3.05	8.00	.93	1.50	4.04
76-108-01	2"	1.50	2.75	5.50	3.24	8.00	.93	1.50	6.05
76-109-01	2-1/2"	2.50	3.37	6.75	4.12	8.00	2.75	3.37	15.57
76-100-01	3"	2.50	3.37	6.75	4.12	8.00	2.75	3.37	16.79

For Pressure/Temperature Ratings,
Refer to Page N-15, Graph No. 14
(1/4" to 1")
Refer to Page N-14, Graph No. 12
(1-1/4" to 2")
Refer to Page N-12, Graph No. 8
(2-1/2" to 3")

JOHN W. DANFORTH COMPANY

Niagara County Refuse Site Wheatfield, New York JWD JOB #4368

15001 2.5A - Gate Valves

Contents:

1 page	- cover sheet
2 pages	- Iron valves, quality management, materials, rated working pressures, design gate valves classes 125 and 250, stem, packing gland assembly, packing, disc, yoke and bonnet, stuffing box, seat ring, handwheel or operating nut
2 pages	- cover sheet
55	- Iron Valves, service features

Supplied by IDS Lakes Pipe & Supply Company Inc

SUBMITTAL COVER

PARSONS ENGINEERING SCIENCE, INC. PROJECT NO. 733549.10100

CONTRACTOR: HASELEY CONSTRUCTION COMPANY, INC.

ADDRESS: 10315 LOCKPORT ROAD, NIAGARA FALLS, NY 14304

PROJECT: NIAGARA COUNTY REFUSE SITE

SUBMITTAL NO: 47A (1)

DATE OF SUBMITTAL: 02/04/99

TYPE OF SUBMITTAL (CHECK ONE)

☒ Product Data	☐ Schedule	☐ Performance Data
☐ Sample	☐ Warranty	☐ Operations & Maintenance Data
☐ Color Selection	☐ Test Report	☐ Record Document

☒ LETTER / DANFORTH

DESCRIPTION OF SUBMITTAL:

Product Name: GATE VALVES

Manufacturer: STOCKHAM VALVE AND FITTINGS

Subcontractor/Supplier: JOHN W. DANFORTH CO.

Section No.(s): 15001

Drawing No.(s): M-2

Part/Paragraph: 2.5

Detail Reference: _____

RECEIVED

D FEB 12 1999 **D**

JOHN W. DANFORTH CO.

ENGINEER'S APPROVAL

**SUBMITTAL REVIEWED SOLELY
FOR GENERAL COMPLIANCE
WITH CONTRACT DOCUMENTS**

DATE BY

KD 2-5-99 WED

NOTED

FABRIC

CON

MAINT

SUBMIT

**FABRICATION/INSTALLATION/PRODUCTION
MAY NOT PROCEED.**

PARSONS ENGINEERING SCIENCE

CONTRACTOR'S APPROVAL STAMP

**NIAGARA COUNTY REFUSE SITE
HASELEY CONSTRUCTION CO., INC.**

Date: 2/4/99

Item: GATE VALVE

Specification: MECHANICAL

Section: 15001 Para. No. 2.5

Drawing No. M-2 Page No. 3

Location: NCRS Submittal No. 47A (1)
APPROVED BY: WILLIAM L. BEY

RECEIVED STAMPS

RECEIVED
FEB 05 1999
KD

Stockham iron body valves are proven performers in mechanical systems of commercial buildings throughout America. Chemical plants, steel mills, shipyards, refineries, pulp and paper mills, and utilities have also found that Stockham iron body valves do the job better and longer for their many general services.

QUALITY MANAGEMENT Stockham is committed to a philosophy of total quality management. It begins with design, to comply with pertinent MSS and ANSI Standards. Continuous improvement is applied in a process to improve materials and services to meet or exceed customer needs. Stockham complies with ISO 9001, EN 29001 and ANSI/ASQC Q91 and is certified by Lloyd's Register Quality Assurance (LRQA).

MATERIALS The iron used as the basic valve material conforms to the chemical and physical requirements of the American Society of Testing and Materials A-126 Class B for Cast Iron Valves. Cast iron valves with 3% nickel content can also be provided. All valve materials are listed and described in the Technical Data Booklet.

RATED WORKING PRESSURES The pressure-temperature ratings of Stockham iron body valves in this catalog section are as follows:

**PRESSURE-TEMPERATURE RATINGS
NONSHOCK**

TEMPERATURE (°F)	PRESSURE (PSIG)				
	CLASS 125 CAST IRON			CLASS 250 CAST IRON	
	SIZES	SIZES	SIZES	SIZES	SIZES
	2-12	14-24	30-36	2-12	14-24
-20 to 100	200	150	150	500	300
150	200	150	150	500	300
200	190	135	115	460	280
225	180	130	85	440	270
250	175	125	65	415	260
275	170	120	50	395	250
300	165	110		375	240
325	155	105		355	230
350	150	100		335	220
375	145			315	210
400	140			290	200
425	130			270	
450	125			250	
500					
600					
650					

The temperature shown for a corresponding pressure rating is the temperature of the pressure containing shell of the component. In general, this temperature is the same as that of the contained fluid. Composition disc valves are excluded from these ratings.

**DESIGN: GATE VALVES—
CLASSES 125 and 250.**

Stem—All stems are designed for ample strength and are machined to function easily. Backseats are provided on OS&Y valves.

Packing Gland Assembly—Glands and gland flanges have a ball and socket joint which assures alignment. It provides for proper packing compression without binding against the stem.

Packing—TFE-Aramid packing provides excellent sealing qualities for general services up to 450°F within a pH range of 3 to 12. The braid-over-braid construction of acrylic and novaloid fibers is impregnated with virgin PTFE dispersion. A special break-in lubricant is added.

Disc—Strong, solid wedge discs have disc guides for precision seating with minimum friction against body seats.

Yoke and Bonnet—One-piece yoke bonnets are utilized on 12" and smaller size OS&Y valves. Larger sizes have separate yokes and bonnets. Flexible graphite gaskets are applied between bonnet and body for joint integrity.

Stuffing Box—NRS valves have stuffing boxes assembled to bonnets to accommodate the packing gland assembly.

Seat Ring—Buttress-type seat rings are bottom-seated with accurately machined faces to match disc faces.

Handwheel or Operating Nut—Handwheels have large diameters for good leverage. Finger grips are cast on rims for easy gripping. Operating nuts, 2" square may be furnished on any NRS valve if specified.

SINCE 1884



JOHN W. DANFORTH COMPANY
GENERAL CONTRACTORS FOR MECHANICAL SYSTEMS

JWD
GROUP, INC.

Industrial Piping • Power Plants • Heating/Air Conditioning • Plumbing • Air and Water Pollution Control

January 21, 1999

RECEIVED

JAN 25 1999

HASELEY TRUCKING CO., INC.

HASELEY CONSTRUCTION COMPANY
10315 LOCKPORT ROAD
NIAGARA FALLS, NY 14304

Attention: Mr. William Bey, Project Engineer

Subject: Niagara County Refuse Site
Your Job No. 9812
Our Job No. 4368
Gate Valves

Gentlemen,

We have received the Gate Valve submittal, Section 15001, Para. 2.5, (your submittal number 47), marked "reviewed as noted". The remarks on the submittal request a class 150 Iron gate valve.

We have reviewed this request with our suppliers and confirmed that a class 150 valve is not available in iron. The standard for iron valves is class 125 and class 250. We are enclosing for you use and submittal to the engineer eight (8) copies of the pressure - temperature chart to verify that the class 125 valve will exceed the requirements for this project. The class 125 valve is rated at 200 PSI, water, oil, or gas.

If necessary, we will resubmit the class 125 valve, approval of this letter is sufficient for our files.

Very truly yours,
JOHN W. DANFORTH COMPANY



Karl Bykowski
Vice President

560 56th Street • Niagara Falls, New York 14304 • Tel: 716-283-1754 • Fax: 716-283-6783
10 Ramona Street • Rochester, New York 14613 • Tel: 716-254-0070 • Fax: 716-254-0079
2222 Park Street • Syracuse, New York 13208 • Tel: 315-476-8200 • Fax: 315-476-8203
1940 Fillmore Avenue • Buffalo, New York 14214 • Tel: 716-832-1940 • Fax: 716-832-2388

SUBMITTAL COVER

PARSONS ENGINEERING SCIENCE, INC. PROJECT NO.

733549.10100

CONTRACTOR:

HASELEY CONSTRUCTION COMPANY, INC.

ADDRESS:

10315 LOCKPORT ROAD, NIAGARA FALLS, NY 14304

PROJECT:

NIAGARA COUNTY REFUSE SITE

SUBMITTAL NO:

47

A

DATE OF SUBMITTAL:

01/18/99

TYPE OF SUBMITTAL (CHECK ONE)



Product Data



Schedule



Performance Data



Sample



Warranty



Operations & Maintenance Data



Color Selection



Test Report



Record Document

DESCRIPTION OF SUBMITTAL:

Product Name:

GATE VALVES

Manufacturer:

STOCKHAM VALVES AND FITTINGS

Subcontractor/Supplier:

JOHN W. DANFORTH COMPANY

Section No.(s):

15001

Drawing No.(s):

M-2

Part/Paragraph:

2.5

Detail Reference:

ENGINEER'S APPROVAL

FOR GENERAL REVIEW
WITH CONTRACT DOCUMENTS
DATE BY

REVIEWED

1/19/99 REVIEWER IS NOTED
FABRICATION/INSTALLATION/PRODUCTION
MAY PROCEED

REVISE AND RESUBMIT

REJECTED

FABRICATION/INSTALLATION/PRODUCTION
MAY NOT PROCEED

PARSONS ENGINEERING SCIENCE

CONTRACTOR'S APPROVAL STAMP

NIAGARA COUNTY REFUSE SITE
HASELEY CONSTRUCTION CO., INC.

Date: *1/18/99*

Item: *GATE VALVE*

Specification: *Mechanical*

Section: *15001* Para. No. *2.5*

Drawing No. *M-2* Page No. *3*

Location: *Nees* Submittal No. *47*

APPROVED BY: WILLIAM L. BEY

RECEIVED STAMPS

RECEIVED

BY:

W. L. Bey

JOHN W. DANFORTH COMPANY

PROJECT : Niagara County Refuse Site

JOB NO.: 4368

CUSTOMER PROJECT NO.: 9812

ENGINEER: Conestoga Rovers & Associates

DATE OF SUBMISSION: 1/12/99

PREVIOUS SUBMISSION: _____

CONTRACTOR: JOHN W. DANFORTH COMPANY

SUBCONTRACTOR: _____

SUPPLIER: IDS Lakes Pipe & Supply Co., Inc.

MANUFACTURER: Stockham Valve

SPEC. SECTION: 15001.2.5A - Gate Valves

DEVIATIONS NOTED: _____

CLASS 125 IRON GATE VALVES

IS:
G-620
G-623
G-624

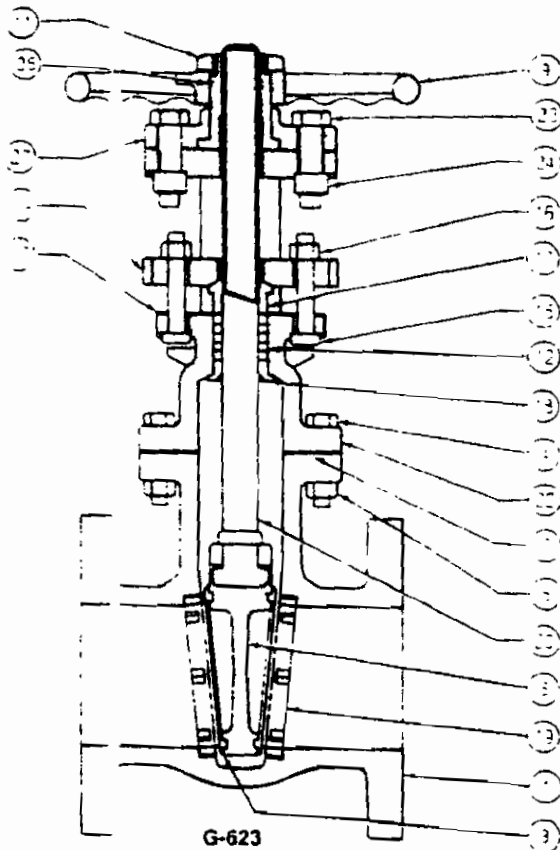
RISEING STEM • BOLTED BONNET
SOLID WEDGE DISC • OS&Y

SEE PAGE 46 FOR PRESSURE-TEMPERATURE RATINGS.

SERVICE FEATURES

All iron trim suggested for fluids which attack bronze but not iron. • Fully guided discs minimize wear and extend valve life. • OS&Y gate valves are not recommended where outside threads are exposed to high temperatures

IRON VALVES



G-623



G-623 IBBM, FLANGED ENDS
G-624 ALL IRON, FLANGED ENDS

SIZE	WGT.		B	C	M
	G-623	G-624			
2	41	40	15.50	8.00	7.00
2½	50	49	16.75	8.00	7.50
3	67	67	18.75	8.00	8.00
4	114	114	23.13	10.00	9.00
5	152	—	28.00	12.00	10.00
6	191	190	31.89	12.00	10.50
8	316	316	40.38	14.00	11.50
10	499	496	49.00	16.00	13.00

SIZE	WGT.		B	C	M
	G-623	G-624			
12	723	723	56.81	18.00	14.00
14	1013	—	64.88	20.00	15.00
16	1349	—	75.19	22.00	16.00
18	1750	—	82.00	22.00	17.00
20	2110	—	90.56	24.00	18.00
24	3114	—	105.31	30.00	20.00
*30	5541	—	129.63	36.00	24.00
*36	7959	—	155.63	42.00	28.00

*G-623 Only-Recommended With Gear Operator

† Not Shown

G-620, G-623 comply with MSS-SP-70 Type I.



G-620 IBBM, THREADED ENDS

SIZE	WGT.	B	C	M
2	30	15.50	8.00	5.50
2½	36	16.75	8.00	5.88
3	50	18.75	8.00	6.25
4	85	23.13	10.00	7.00

NO.	DESCRIPTION	MATERIAL	ASTM SPEC.	UNS NO.
1	BODY	CAST IRON	A-126 Class 3	F12102
2	BONNET	CAST IRON (4-36)	A-126 Class 3	F12102
3	BONNET GASKET	MONASBESTOS		
4	BONNET BOLT	STEEL	A-307 Grade A	
5	BONNET BOLT NUT	STEEL	A-563 Grade A	
6	DISC	G-620, G-623 BRONZE (2-31) CAST IRON (4-30) DUCTILE (36)	3-62 A-126 Class 3 A-395	33600 F12102 F32800
7	DISC PIN	G-624 CAST IRON G-623 BRASS (5, 10-36)	A-126 Class 3 3-16	F12102 33600
8	DISC RING	G-624 STEEL (5, 10-36) BRONZE (4-36)	A-108 3-62	310180 33600
9	HANDWHEEL	CAST IRON (2-41) CAST IRON (5-24)	A-97 A-126 Class 3	F22000 F12102
10	HANDWHEEL LOCKNUT	STEEL (30-36)		
11	HANDWHEEL LOCKNUT	STEEL (30-36)	A-97	F22000
12	PACKING	ACRYLIC & NYLON FIBERS W/TEFLON MONASBESTOS		
13	PKG GLAND	G-620, G-623 BRONZE G-624 CAST IRON	A-126 Class 3	F12102
14	PKG GLAND PLUG	CAST IRON (2-3, 5, 10-36) CAST IRON (4-31)	A-97 A-126 Class 3	F22000 F12102
15	PKG GLO PLUG EYEBOL	STEEL (5, 10-36)	A-307 Grade A	
16	PKG GLO PLUG BOLT (SO HEAD)	STEEL (2-4, 5-8)	A-307 Grade A	
17	PKG GLO PLUG EYEBOL NUT	G-623 BRASS (5, 10-36) G-624 STEEL (5, 10-36)	3-15 A-307 Grade A	33600 F12102
18	PKG GLO PLUG NUT	STEEL (2-4, 5-8)	A-563 Grade A	
19	PKG GLO PLUG EYEBOL SP. PIN	STEEL (5, 10-36)		
20	PKG GLO BOLT RETAINER	STAINLESS STEEL (2-4, 5-8)	A-307 SS Preswaged	
21	REPAIR RING	G-620, G-623 BRONZE G-624 CAST IRON	3-62 A-126 Class 3	33600 F12102
22	SEAT BUSHING	G-620, G-623 BRONZE G-624 CAST IRON	3-62 A-126 Class 3	33600 F12102
23	STEM	G-624 STEEL G-620, G-623 COPPER-SIL CON BRONZE (2-41) G-623 BRASS (30-36)	A-108 3-584 3-16	310180 337500 33600
24	Yoke	CAST IRON (14-36)	A-126 Class 3	F12102
25	Yoke BONNET	CAST IRON (12-12)	A-126 Class 3	F12102
26	Yoke CAP BOLT	STEEL	A-307 Grade A	
27	Yoke CAP BOLT NUT (SO HEAD)	STEEL	A-563 Grade A	
28	Yoke BUSHING	G-620, G-623 BRONZE G-624 DUCTILE IRON	3-62 A-395	33600 F32800
29	Yoke CAP SCREW	G-623, G-624 STEEL (14-36)	A-307 Grade A	
30	Yoke CAP	CAST IRON	A-126 Class 3	F12102

SECTION M5
FLOW METERS

JOHN W. DANFORTH COMPANY

Niagara County Refuse Site Wheatfield, New York JWD Job # 4368

15001 2.6

Flow Meter (Kent Meter)

Contents:

1 page	- cover sheet
2 pages	- Kent Turbine Meters model T-3000 Bronze magnetic drive, round flanged Ends.
2 pages	- Specification sheet Kent Pulsers for T-3000C Turbine Meters
2 pages	- 6 digit universal rate/totalizer Batch controller, Model PD693 Frequency / pulse input

SUBMITTAL COVER

PARSONS ENGINEERING SCIENCE, INC. PROJECT NO. 733549.10100

CONTRACTOR: HASELEY CONSTRUCTION COMPANY, INC.

ADDRESS: 10315 LOCKPORT ROAD, NIAGARA FALLS, NY 14304

PROJECT: NIAGARA COUNTY REFUSE SITE SUBMITTAL NO: 47C (1)

DATE OF SUBMITTAL: 02/19/99

TYPE OF SUBMITTAL (CHECK ONE)

☒ Product Data	☐ Schedule	☐ Performance Data
☐ Sample	☐ Warranty	☐ Operations & Maintenance Data
☐ Color Selection	☐ Test Report	☐ Record Document
☐		

DESCRIPTION OF SUBMITTAL:

Product Name: FLOW METER (KENT METER)

Manufacturer: KENT METER

Subcontractor/Supplier: JOHN W. DANFORTH CO., INC. / RITEC ENVIRONMENTAL

Section No.(s): 15001 Drawing No.(s): M-2

Part Paragraph: 2.6 Detail Reference: _____

ENGINEER'S APPROVAL

SUBMITTAL REVIEWED SOLELY FOR GENERAL COMPLIANCE WITH CONTRACT DOCUMENTS	
DATE/BY	
<u>2-19-99</u> <u>KD</u>	
REMARKS	NOTED
MATERIAL	SECTION
	RESUBMIT
FABRICATION/INSTALLATION/PRODUCTION MAY NOT PROCEED.	
PARSONS ENGINEERING SCIENCE	

CONTRACTOR'S APPROVAL STAMP

NIAGARA COUNTY REFUSE SITE
HASELEY CONSTRUCTION CO., INC.

Date: 2-19-99

Item: FLOW METER

Specification: MECHANICAL

Section: 15001 Para. No. 2.6

Drawing No. M-2 Page No. 3

Location: ALCS Submittal No. 47C (1)
APPROVED BY: WILLIAM L. BEY

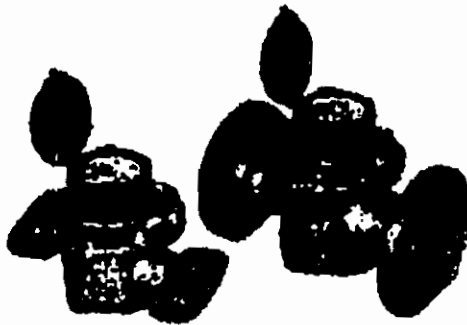
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RECEIVED
FEB 19 1999
BY: <u>K. Danner</u>

Specification Sheet

Kent Turbine Meters Model T-3000 Bronze, Magnetic Drive, Round Flanged Ends

Sizes 1 1/2", 2" & 3"



Description

Operation. The T-3000 Turbine Meter is designed for installation where occasional low and moderate to high sustained flows are demanded. Water passes through the meter without a change in flow direction, driving a helix rotor in direct proportion to the quantity of water passing through the meter. Rotor revolutions are transferred to a register by appropriate reduction gearing and a magnetic drive.

Compliance to Standards. The T-3000 Turbine Meter complies with all performance and material requirements of the American Water Works Association Standard C-701, Class II In-Line (High-Velocity) Type, as most recently revised.

Installation. The meter must be installed in a clean pipeline, free from any foreign materials. Install the meter with direction of flow as indicated by the arrow cast in the meter case. The meter may be installed in horizontal or inclined lines. It is recommended that a Kent Plate Strainer be used to protect the turbine and help reduce the effects of turbulence. The installer should consider a bypass pipe with gate valves for use during maintenance and a downstream test tee for future field testing.

Application. The meter is for use in **POTABLE COLD WATER** up to 120° F (50° C) and working pressures up to 150 psi. The meter will perform with accuracy registration of 100% ± 1 1/2% within the normal flows*. Both pressure loss and accuracy tests are made before shipment. No adjustments need be made before installation.

Construction. The meter consists of a main case, a measuring element, a case cover and a magnetically driven register

Specifications

Size:	1 1/2"	2"	3"
95%-101% Accuracy GPM	2.90	2.99	4
98.5%-101.5% Accuracy GPM	4-200	4-200	5-750
Continuous Flow GPM	160	180	600
Maximum Flow GPM	200	200	750
Operating Pressure psi	150	150	150
Operating Temperature°F	120	120	120

Sweep Hand Registers

US Gallons	100	100	100
Cubic Feet	10	10	10
m ³ - Cubic Meters	1	1	1
Imperial Gallons	100	100	100

Capacity of Register

US Gallons (millions)	100	100	100
Cubic Feet (millions)	10	10	10
m ³ Cubic Meters (millions)	1	1	1
Imperial Gallons (millions)	100	100	100

Register Type

Permanently sealed direct reading register.

Materials

Main Case	Bronze
Top Cover Plate	Bronze
Body O-Ring	Neoprene Rubber
Case Bolts	Stainless Steel
Measuring Element	Polyphenylene Oxide
Rotor	Polypropylene
Rotor Bushings	PTFE Compound
Rotor Thrust Bearing	Ceramic Jewel
Rotor Spindle	Tungsten Carbide
Undergearing	Polycetal Resin
Register Lens	Tempered Glass
Register Housing and Lid	Synthetic Polymer or Bronze
Register Can	90% Copper Alloy

Kent Meters, Inc.
An ABB Kent Meter Division Company

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assembly. The main case is cast in bronze with raised characters showing model, size and direction of flow. The case has a threaded inlet. A case dowel pin is inserted for locating the bronze cover plate. The measuring element assembly consists of the rotor, strainer, vanes, accuracy regulator, spindles and gears, filters and undergear assembly. The measuring element is attached to the underside of the cover with four stainless steel screws and washers, one of which is placed eccentrically in the cover. The internal regulator assembly is interconnected with an external regulator shaft located on top of the cover allowing meter calibration without depressurizing the test bench or meter service. The regulator is protected by a tamperproof device. The main case and cover are assembled with an O-ring gasket and stainless steel bolts. The register assembly is secured to the main case with a tamperproof screw and is hinged over the inlet throat. However, the register can be rotated and locked in any 360 degree position therein.

Register. The register is contained within a 80% copper seamless can which is vacuum purged then filled with a dry nitrogen gas to eliminate condensation. The 1/4" true tempered glass lens is secured in an "L" shaped gasket, then roll sealed to produce a permanent sealed design. To assure easy reading, the totalizer wheels are large and color coded. The applicable size, model, registration, part number and date code are printed on the calibrated dial face. Moving clockwise during operation, the extra thin sweep hand does not interfere with meter reading, and the flow indicator will detect plumbing leaks.

Magnetic Drive. The magnetic drive design eliminates miscoupling associated with right angle drives. Torque is absorbed in the undergear assembly below the driving magnet. Consequently, the driving magnet at all flows is turning slowly, assuring magnetic coupling with the register assembly. The undergearing is protected by an enclosure appropriately filtered.

Connections. The 1 1/2" and 2" meters are available with 2-bolt oval flanged end connections and the 3" meter is available with 4-bolt round flanged end connections. Both flanged connections conform to ANSI B16.1 cast-iron pipe flange, Class 125. Both

bronze and cast-iron companion flanges are available. The companion flanges are faced, drilled and tapped with ANSI B2.1 internal taper pipe thread and conform to ANSI B16.1 cast-iron pipe flange, Class 125.

Maintenance. The measuring element with integral straightening vanes can be removed, repaired or replaced without removing the main case from the service line. Blank cover plates are available for use during repair. Pretested and calibrated measuring elements with cover plates and registers are available for exchange or purchase. In addition, Kent Meters, Inc. maintains a fully equipped and staffed repair facility in Ocala, Florida.

Remote Meter Read (RMR). Kent's RMR system permits visual remote reading from basements, pits, or inaccessible meter settings. Each register pulse is equal to a predetermined volume of water throughput. The pulses are carried by a 2-conductor wire to a remote well unit. Pulses are accumulated and displayed on the well unit totalizer.

SCANCODER® Electronic Meter Read (EMR). Kent's EMR system permits electronic interrogation of the encoder register's six number wheels. The 2-wire encoder register features an optional waterproof glass lens and potted terminals for flooded pit installations, expanded data field to include reading, programmable ten digit serial number, registration type billable units and special security number. A simple checksum, standard error codes and cable lengths up to three hundred (300) feet, are all standard features.

Dimensions and Net Weights

Meter Size	Dimensions (inches)					Weight (lbs.)
	A	B	C	D	E	
1 1/2" Oval	10	7 3/8	2 3/16	7 3/8	5 5/8	19 1/2
1 1/2" Round	10	7 3/8	2 3/16	7 3/8	5 1/16	20
2" Oval	10	7 3/8	2 7/16	7 3/8	6 1/8	21 1/2
2" Round	10	7 7/8	2 9/16	7 3/8	6 1/16	22
3"	12	8 3/8	3 19/16	7 3/8	7 1/2	33 3/4

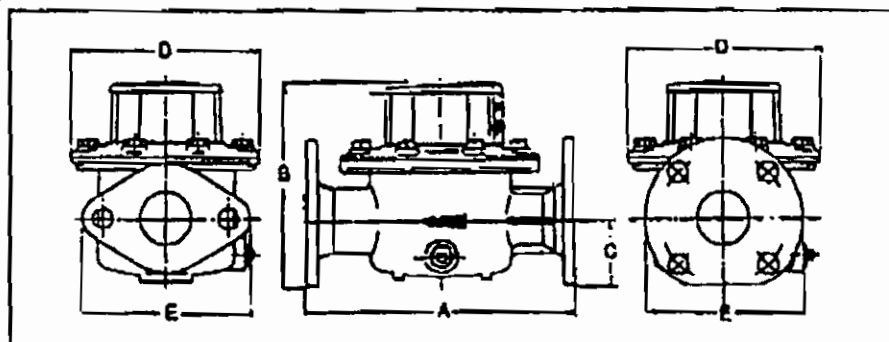
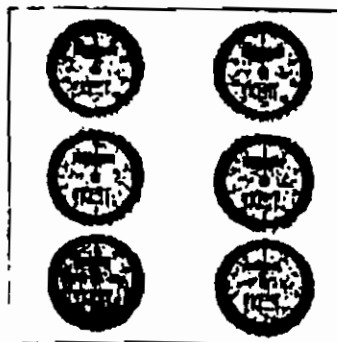


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The company's policy is one of continuous product improvement and the right is reserved to modify the specifications contained herein without notice. These products have been manufactured with current technology in accordance with applicable AWWA Standards.

Kent Meters, Inc.
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Kent Meters, Inc.
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FAX: 416-238-5640

An ABB Kent Meter Division Company
Distributed by:

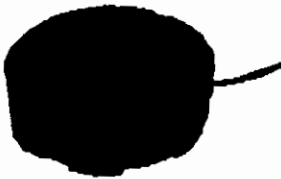
T3-BZ-21501-03/98/5M

Specification Sheet

Kent Pulsers for T-3000C
Turbine Meters

Sizes 1 1/2" - 12"

LRP/ HRP



LRP : (Reed Switch)

HRP : (Slotted Disc -Opto Vane Switch)

These units are designed for use with T-3000C with polymer top plate or bronze top plate. The meters will be produced with polymer top plate unless specified for bronze top plate, bronze meter only.

These units are weather proof with 9 to 10 ft. of 2-wire or 3-wire shielded cable exiting from an epoxy sealed case.

These pulsers are magnetically driven which eliminates miscoupling associated with right angle drives. Torque is absorbed in the undergear assembly in the meter, below the drive magnet. The drive magnet, at all flows, is turning slowly assuring magnetic coupling.

LRP : (Reed Switch) (2 wire)

The pulse element is a reed switch rated at 4 watts, non inductive, magnetically actuated to provide a 50/50 open/close ratio and requires power from an external source. Note: These units have a 100 ohm resistor in series with the reed switch to protect from current surges.

HRP : (Slotted Disc - Opto Vane Switch)

The transmitting element is a slotted disc and opto vane switch which requires power from an external source. Power requirement (6-15 VDC).

Materials

Pulser Body	Plastic
Wire - LRP	2-wire shielded cable
Wire - HRP	3-wire shielded cable

Note: These units are NOT repairable.

Closure Rate (PPG)

(LRP) Low Resolution Pulser
2 Wire Reed Switch 4W

Polymer Top

1 1/2" - 2"	1 cont/USG
3" - 8"	1 cont/10 USG
10" - 12"	1 cont/100 USG

Bronze Top

1 1/2" - 2"	1 cont/USG
3" - 8"	1 cont/10 USG

(HRP) High Resolution Pulser

3 Wire Slotted Disc 6-15 VDC Power Req.

Polymer Top

1 1/2" - 2"	10 cont/USG
3" - 8"	1 cont/USG
10" - 12"	1 cont/10 USG

Bronze Top

1 1/2" - 2"	10 cont/USG
3" - 8"	1 cont/USG

Increase weight of the meter by 12 oz.

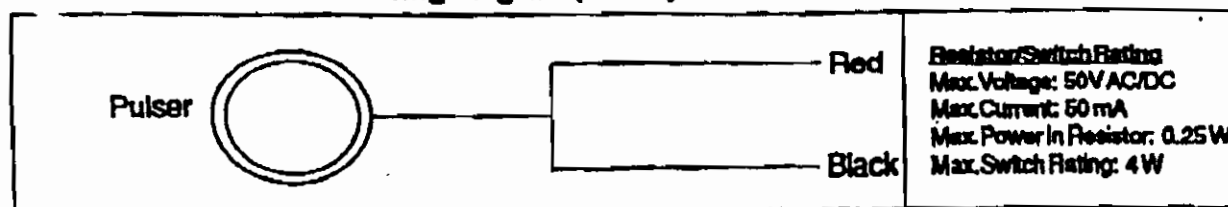
Increase dimension of the meter by 1.14"

Normal height of pulsers = 1.45"

Kent Meters, Inc.

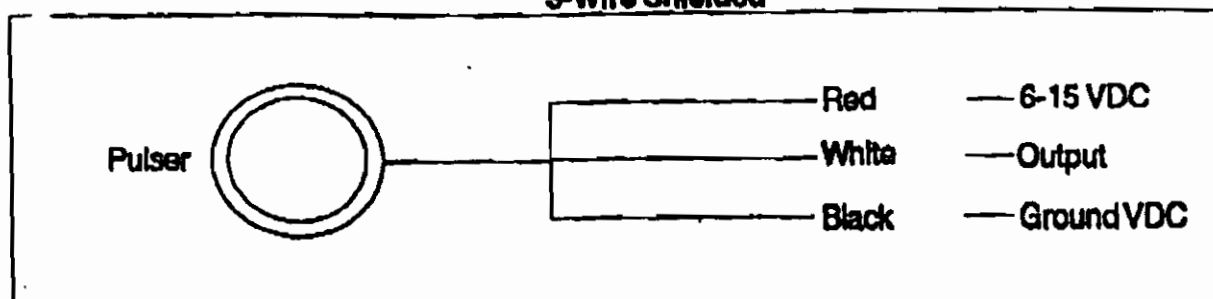
An ABB Kent Meter Division Company

LRP Wiring Diagram (2 Wire) 4W Reed Switch



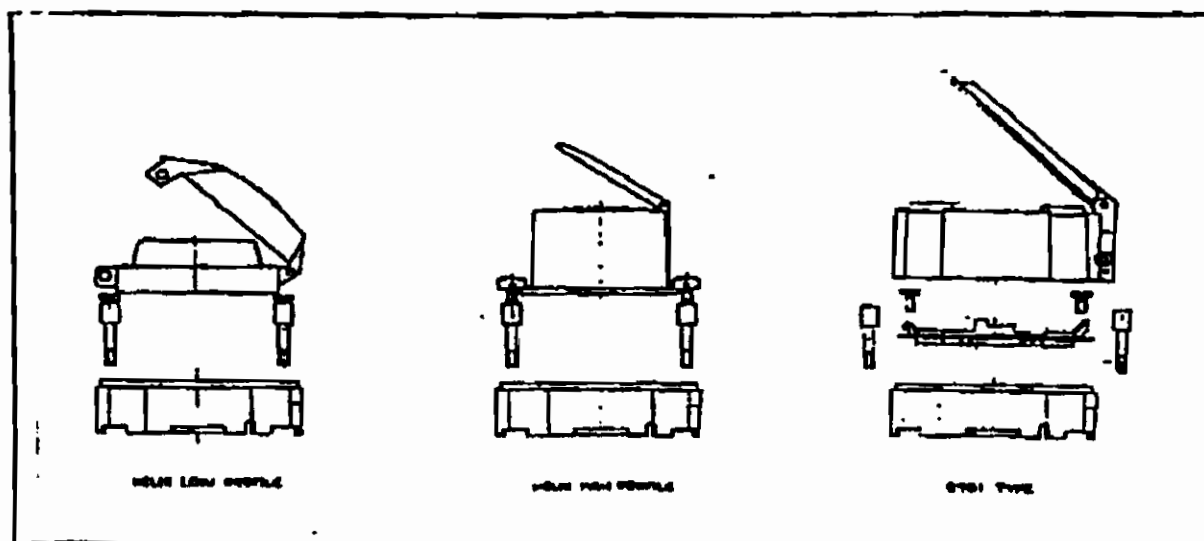
To be wired in series with no regard as to polarity.

HRP Wiring Diagram Slotted Disc 6-15VDC 3-Wire Shielded



NOTE:

When using the HRP pulser with R-100/R-420, a 12 V Zener diode (1 watt rated) must be installed in series between 24 VDC out and the red (6-15 VDC) power in line.



LRP/HRP-73-00000-04/05-1.5M

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FAX: 905-238-5640

An ABB Kent Meter Division Company.
Distributed by:

6 Digit Universal Rate/ Totalizer/Batch Controller



Precision Digital's new Universal Rate/Totalizer Batch Controller may be used to display rate and total as well as provide simple automatic or manual batch control. Models are available for analog inputs such as 4-20 mA or frequency/pulse inputs such as pulse, open collector or switch closures. These meters feature a full six digit display, programmable time base of second, minute and hour, as well as a user programmable multiplier out to five decimal points. They also provide 24 VDC excitation for analog inputs and up to 50 mA for frequency/pulse inputs.

- Alternating Rate/Total Display
- Priority Batch Programming
- Reset Value Tracking
- Automatic, External or Menu Totalizer Reset
- Rate Displayed in Engineering Units per Second, Minute, or Hour
- Total Displayed in any Engineering Unit
- Peak Hold Feature
- Green Display Available



Model PD692 Analog Input

- 4-20 mA, 0-5 V, or 0-10 V Field Selectable Inputs
- Internal or External Calibration
- 11 Point Calibration for Non-linear Inputs
- Square Root Extraction
- Low Flow Cutoff
- Isolated 24 V Transmitter Power Supply
- 2 or 4 Relay Options
- 4-20 mA Output Option
- 1-36 VDC Powered Version Available



Model PD693 Frequency/Pulse Input

- Pulse, Open Collector, Switch Closure, TTL or Square Wave Field Selectable Inputs
- K-factor, Internal, or External Calibration
- 11 Point Calibration for Non-linear Inputs
- Low Flow Cutoff
- 12 VDC @ 50 mA or 24 VDC @ 20 mA Field Selectable Power Supply
- 2 or 4 Relay Output Options
- 4-20 mA Output Option - Converts the pulse input into an isolated 4-20 mA output
- Tachometer/Rate Meter
- **NEW!** 22-28 VDC Powered Version Available



Specifications

DISPLAY: 6 digit, 0.56" (14.2mm) high efficiency red or green LED.
Rate: 0 to 29,999(0) with selectable extra zero. Total: 0 to 999,999.

Automatic lead zero blanking.

ALTERNATING DISPLAY: Display may be programmed to alternate between rate and total every 10 seconds.

POWER: AC power: 115 VAC $\pm 10\%$, 50/60 Hz, 10 VA.

230 VAC $\pm 10\%$, 50/60 Hz, 10 VA

DC power: 18-36 VDC, 6 watts max. (PD692 only)

22-28 VDC, 6 watts max. (PD693 only)

ISOLATION: AC power 1500 VAC; DC power: 500 VDC.

TOTALIZER: Calculates total based on rate and field programmable multiplier to display total in any engineering unit.

TOTAL RESET: Via front panel ENTER button, external contact closure at terminals RST and COM, or automatically via user selectable preset value #2.

PEAK HOLD: Captures the peak rate and displays it via the front panel ENTER button.

PEAK HOLD INDICATION: Front panel flashing "R" LED.

LOW FLOW CUTOFF: 1 count to 100% F.S., user selectable. To disable low flow cutoff, program cutoff value to zero.

ROLL OVER: Totalizer "rolls over" when display exceeds 999,999.

Relay status reflects display

NON VOLATILE MEMORY: All programming values are stored in non-volatile memory for ten years if power is lost.

LOCKOUT: Jumper at rear of instrument restricts modification of calibration values.

ENVIRONMENTAL: Operating temperature range: 0 to +65°C

Storage temperature range: -40 to +85°C

Relative humidity: 0 to 90% non-condensing

FRONT PANEL: NEMA 4X, panel gasket provided.

ENCLOSURE: 1/8 DIN, high impact plastic, UL 94V-0.

CONNECTIONS: Removable screw terminal block (provided).

UL LISTED NUMBER: E160849; 508 Industrial Control Equipment.

PD692

ANALOG INPUTS: Field selectable: 4-20 mA, 0-20 mA, 0-5 V, 1-5 V, 0-10 V.

CALIBRATION: May be calibrated using internal calibration or by applying an external calibration signal.

CALIBRATION RANGE: 4 mA (1 V) input may be set anywhere in range of the meter. 20 mA (5 V) may be set anywhere above or below 4 mA (1 V) input.

LOOP POWER: (AC powered units only) Isolated, up to 20 mA at 24 VDC regulated $\pm 5\%$, noise less than 10 mVpp. Max. loop resistance of 1200 ohm. Use to power either external transmitter or 4-20 mA output signal.

LINEAR INPUT ACCURACY: 0.05% of calibrated span, ± 1 count.

SQUARE ROOT EXTRACTION ACCURACY: $\pm 0.1\%$ F.S. ± 1 count from 0-100% of flow, $\pm 1\%$ F.S. (0-10% flow).

MINIMUM INPUT SPAN: 1.6 mA between points.

INPUT IMPEDANCE: Voltage ranges, greater than 300 Kohm; current range, 100 ohm.

PD693

FREQUENCY INPUTS: Field selectable: Pulse or Square Wave 0-5 V or 0-12 V @ 30 kHz; TTL; Open Collector 4.7 Kohm pullup to 12 V @ 30 kHz; Switch Contact 4.7 Kohm pullup to 12 V @ 40 Hz.

LOW VOLTAGE/MAG PICKUP (isolated): Sensitivity: 125 mV p-p; Hysteresis: 30 mV.

CALIBRATION: May be calibrated using K-factor scaling, internal calibration or by applying an external calibration signal.

OUTPUT POWER: (AC powered units only) Field selectable, isolated, 12 VDC @ 50 mA for sensor supply, or 24 VDC @ 20 mA regulated $\pm 5\%$, noise less than 10 mVpp. Max. loop resistance of 1200 ohm.

ACCURACY: $\pm 0.1\%$ of full scale.

MINIMUM INPUT SPAN: 2.0 Hz between points.

INPUT IMPEDANCE: Pulse Input: Greater than 300 Kohm @ 1 kHz
 Open Collector/Switch Input: 4.7 Kohm pull-up resistor to 12 V.

Relays

RATING: 2 or 4 SPDT (form C); rated 2 Amp @ 30 VDC or 2 Amp @ 250 VAC resistive load; 1/14 HP @ 125 / 250 VAC for inductive loads.

TOTALIZER PRESETS: 2.

Relays #1 and #2 are assigned to total and may be programmed anywhere in the range of the meter; relays trip when total exceeds preset value and reset when total is reset to zero. #2 preset in user programmable to reset total to zero when preset value is reached. A delay of between 1 and 999 seconds can be programmed on the PD693 while the PD692 has a fixed value of 10 seconds before relay #1 and #2 reset.

PRESET VALUE TRACKING: Relay #1 can be programmed to trip at any point below relay #2 preset value. If relay offset mode is selected relay #1 will always trip at a programmed offset value before relay #2 trips, ex. if the relay offset is set at 10 then relay #1 will trip at 10 counts before relay #2.

RATE RELAYS: 2.

#3 & #4 assigned to rate, any combination of high or low alarms.

RATE ALARM DEADBAND: 0-100% of full scale, user selectable.

RATE RELAY RESET: User selectable, relay #3 and #4

a. Automatically when the input passes the reset point.

b. Automatically + manually (via user supplied external contact closure at terminals ACK and COM, or front panel ACK button). Manual reset resets all manually resettable relays.

FAILSAFE OPERATION: The relay coils are energized in the non-alarm condition. In the case of a power failure, the relays will go to the alarm state.

AUTO INITIALIZATION: When power is applied to the meter, relays #1 and #2 will reflect the state of the accumulated Total value in memory, relays #3 and #4 will reflect the state of the input to the meter.

Isolated 4-20 mA Transmitter Output for Rate

CALIBRATION RANGE: Anywhere in range of meter. SQ1 count minimum span.

OUTPUT LOOP RESISTANCE:

power supply	min	max
24 VDC	10 ohm	600 ohm
35 VDC (external)	600 ohm	1000 ohm

ACCURACY: $\pm 0.1\%$ F.S., ± 0.004 mA

ISOLATION: 500 VDC or peak AC, input-to-output or input/output-to-power line.

EXTERNAL LOOP POWER SUPPLY: 35 V max.

**PRECISION
DIGITAL**

Phone (317) 272-2791 • Fax (317) 272-2873 • Natick, MA

SECTION M6
WYE STRAINERS

JOHN W. DANFORTH COMPANY

Niagara County Refuse Site Wheatfield, New York JWD Job # 4368

- Wye Strainers
- Model No. 601-010 L1

Contents:

2 pages

-RPC 90
Model Number description
Strainer screen detail

Page 1

RP&C Cast Iron Y-Type Strainers
601-010 Style T, NPT Connection

Supplied by;

IDS Lake Pipe & Supply Corp.

STRAINERS

6XX - X X X - XX

TYPE	CONNECTION	MATERIAL
601 "Y" Type	0 NPT	1 Cast Iron
602 "Y" Type, Gasketed Blow-off Plug	1 Socket Weld	2 Steel
603 "Y" Type, Bolted	2 Class 125/150 Flange	3 CF8M
604 Angle Block	3 Class 250/300 Flange	4 Ductile Iron
605 Basket, Clamped Cover	4 Class 600 Flange	5 Bronze
606 Basket, Bolted Cover	5 Butt Weld, Class 150, Sch. 40	6 Chrome Moly, WC6
607 Class 1500, Forged Carbon Steel	6 Butt Weld, Class 300, Sch. 40	7 SAE 1020
608 Temporary Cone	7 Butt Weld, Class 600, Sch. 80	8 Carbon Steel, ASTM A105
609 Temporary Basket	8 Butt Weld, Class 1500	9 Std. % Open Area (Temp. Str. Only)
	9 Socket Weld x NPT	0 150% Open Area (Temp. Str. Only)
		A 200% Open Area (Temp. Str. Only)

SIZE

- 1 1/4" 2 3/8" 3 1/2" 4 3/4" 5 1" 6 1 1/4" 7 1 1/2" 8 2" 9 2 1/2" 0 3" A 4" B 5" C 6" E 8" G 10" H 12" J 14" K 16" L 18" M 20" P 24"

SCREEN

SCREEN TYPE SCREEN MATERIAL

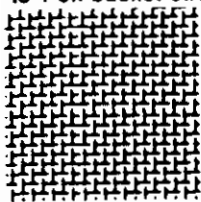
- A 20 MESH 1 304SST
 B 30 MESH 2 MONEL
 C 40 MESH 3 316SST
 D 60 MESH 4 BRASS
 E 80 MESH 5 CARBON STL (TEMP ONLY)
 F 100 MESH 6 304SST/MAGNETS
 G 60-80-100 MESH 7 MONEL/MAGNETS
 H 200 MESH 8 316SST/MAGNETS
 I 020 PERF 9 BRASS/MAGNETS
 J 027 PERF
 K 033 PERF
 L 045 PERF
 M 062 PERF
 N 125 PERF
 O 187 PERF
 P 250 PERF
 Q 375 PERF
 R 312 PERF
 S 156 PERF
 T 16 MESH
 U 12 MESH
 V 500 PERF

MODEL: 601-010-L1

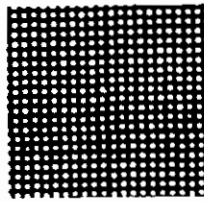
STRAINER SCREEN DATA

Our Strainer Screens and Baskets are made in a variety of perforations and mesh openings to best suit the application. Standard material is stainless steel. Other screen materials are available on special request.

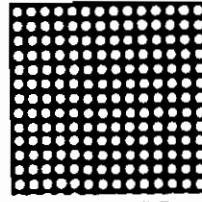
When baskets are constructed of very fine mesh wire cloth they are reinforced with a rigid outer shell of perforated sheet. Perforated baskets are made of sheet stainless steel, the thickness of which is not greater than half the size of the perforations. Ratios of screen or basket opening to inlet pipeline area are as high as 8 to 1 on basket strainers.



20 MESH



.033" PERF.



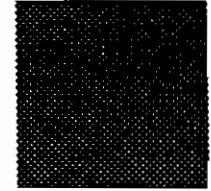
.045" PERF.



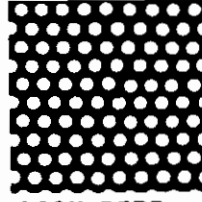
100 MESH



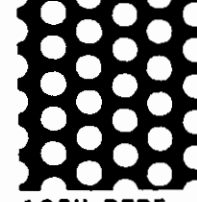
60 MESH



40 MESH



.062" PERF.



.125" PERF.



.250" PERF.

OPENING RATIOS

The following steps should be taken to determine the ratio of openings through strainer baskets or screens to the area of inlet pipe size

1. Determine the size mesh or perforation required to give the desired particle retention
2. Multiply the total area of the screen by the percent of open area of the perforation or mesh material. The result is the open area of the screen (Total area of the screen is given in the dimensional charts.)
3. The open area of the screen divided by the area of the pipe will give the ratio of open area of the screen to the area of the pipe.
4. To determine the ratio of open area to the pipe on mesh lined reinforced screens, complete step two (2) to find the open area of the mesh. Multiply the open area of the mesh by the percent of open area of the reinforcing material. The result divided by the area of the pipe will be the ratio of open area of the screen to the area of the pipe

MAGNETIC INSERTS:

Magnetic inserts may be furnished, which when placed inside the strainer screen or basket will collect very fine ferrous metal particles entrained in the liquid thus protecting equipment against abrasive damage

Skilled specialists in our engineering department are available to provide customer assistance on special straining applications.

PRESSURE—TEMPERATURE RATINGS FOR STEEL AND ALLOY STRAINERS

Pressure temperature ratings shown are for non-shock conditions. For any requirements beyond those, consult factory engineering.

DEGREES F	CLASS 150			CLASS 300			CLASS 600			CLASS 900			CLASS 1500		
	CARBON STEEL	STAIN. STEEL	CM STEEL	CARBON STEEL	STAIN. STEEL	CM STEEL	CARBON STEEL	STAIN. STEEL	CM STEEL	CARBON STEEL	STAIN. STEEL	CM STEEL	CARBON STEEL	STAIN. STEEL	CM STEEL
—20 to 100	285	275	290	740	720	750	1480	1440	1500	2220	2160	2250	3705	3600	3750
200	260	240	260	675	620	710	1350	1240	1425	2025	1860	2135	3375	3095	3560
300	230	215	230	655	560	675	1315	1120	1345	1970	1680	2020	3280	2795	3365
400	200	195	200	635	515	660	1270	1030	1315	1900	1540	1975	3170	2570	3290
500	170	170	170	600	480	640	1200	955	1285	1795	1435	1925	2995	2390	3210
600	140	140	140	550	450	605	1095	905	1210	1640	1355	1815	2735	2255	3025
650	125	125	125	535	445	590	1075	890	1175	1610	1330	1765	2685	2220	2940
700	110	110	110	535	430	570	1065	865	1135	1600	1295	1705	2665	2160	2840
750	95	95	95	505	425	530	1010	845	1065	1510	1270	1595	2520	2110	2660
800	80	80	80	410	415	510	825	830	1015	1235	1245	1525	2060	2075	2540
850	65	65	65	270	405	485	535	810	975	805	1215	1460	1340	2030	2435
900	50	50	50	170	395	450	345	790	900	515	1180	1350	860	1970	2245
950	35	35	35	105	385	380	205	775	755	310	1160	1130	515	1930	1885
1000	20	20	20	50	365	225	105	725	445	155	1090	670	260	1820	1115
1050					360	140		720	275		1080	410		1800	685
1100					325	95		645	190		965	290		1610	480
1150					275			550			825			1370	
1200					205			410			620			1030	
1250					180			365			545			910	
1300					140			275			410			685	
1350					105			205			310			515	
1400					75			150			225			380	
1450					60			115			175			290	
1500					40			85			125			205	

COMMON PERFORATIONS AND MESH OPEN AREAS

Perf.	Actual Opening	% Open Area	Mesh	Square Opening	% Open Area
.027	.027	23	20	.034	46.2
1/32	.033	29	40	.015	36
3/64	.045	37	60	.010	30.5
1/16	.062	30	80	.007	31.4
1/8	.125	40	100	.0055	30.3
1/4	.250	48			

AREA OF SCHEDULE #40 PIPE

Pipe Size Inches	Area	Inches	Pipe Size Area	Inches	Pipe Size Area
1/2	0.304	3	7.393	10	78.86
3/4	0.533	3 1/2	9.886	12	111.93
1	0.864	4	12.73	14	135.28
1 1/4	1.495	5	20.01	16	176.72
1 1/2	2.036	6	28.89	18	223.68
2	3.355	8	50.03	20	278.00
2 1/2	4.788				

Carbon Steel: ASTM - A216 - WCB
Stainless Steel: ASTM - A296 - CF8M (316)
Chrome-Moly Steel: ASTM - A217 - WC6

R-P&C CAST IRON Y-TYPE STRAINERS

601-010 STYLE T, NPT CONNECTION

SIZES: 1/4" thru 3"

SPECIFICATIONS:

BODY MATERIAL: CAST IRON ASTM A-126 CLASS B

NOTE: The STYLE S has been redesigned and will now be identified as STYLE T. Interchangeability of screens will be effected on Sizes 3/4", 1", 1 1/4", 1 1/2" & 2".

CONSTRUCTION:

Constructed of high-tensile ASTM A-126 Class B Cast Iron with blow-off connections and easily removable cylindrical screens. A tapered seat allows the screen to be self aligning and assures a perfect fit. 2 1/2" and 3" sizes have a flanged blow-off cover.

MILITARY SPECIFICATIONS:

Strainers can be supplied to conform to MIL-S-16293, Type 1, Style Y, Class 250. **CAUTION:** A COMMERCIAL Strainer will not comply with a Military Specification. Consult factory for pricing.

BLOW-OFF OUTLETS:

N.P.T. tapped in sizes specified on dimension table. Not normally furnished plugged.

OPERATING PRESSURES AND TEMPERATURES:

Steam 250 psi at 406° F.
Water, Oil, Gas 400 psi at 150° F.

STANDARD SCREENS:

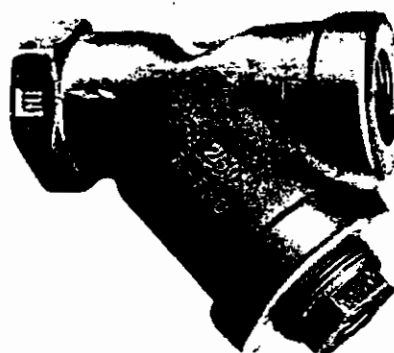
Service	Connections & Sizes	Screen Openings	Screen Material
Liquid	Screwed 1/4" thru 2"	20 mesh	Stainless Steel 18-8
	2 1/2" thru 3"	.045 perf.	
Steam	1/4" thru 2"	20 mesh	Stainless Steel 18-8
	2 1/2" thru 3"	.045 perf.	

Other Screen Perforations & Materials Available on Request.

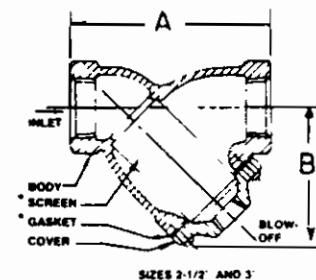
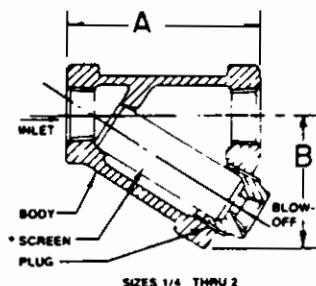
DIMENSIONAL DATA:

NOTE: Dimensions shown are subject to change. Contact factory for certified prints (exact dimensions) when required.

SIZE	STYLE T				
	A	B	Size Blowoff NPT	Ship Weight Lbs.	Screen Area In ²
1/4	2-23/32	1-3/4	1/4	1-1/4	3.0
3/8	2-23/32	1-3/4	1/4	1-1/4	3.0
1/2	3-7/16	2-3/8	3/8	1-3/4	5.4
3/4	4-3/8	3-3/8	3/8	2-1/2	9.4
1	4-7/8	3-1/2	1/2	4-1/2	11.9
1-1/4	5-3/8	4-1/8	3/4	6-1/2	16.2
1-1/2	6-3/8	4-11/16	3/4	8-3/4	23.2
2	7-1/2	5-7/16	1	12-1/2	35
2-1/2	9	6-3/4	1-1/4	22-1/2	47.9
3	10	7-7/8	1-1/4	35-1/4	64.8



STYLE T



MODEL

601-010 L-1

* DENOTES RECOMMENDED SPARE PARTS

SECTION M7

GUARANTEE



JOHN W. DANFORTH COMPANY
GENERAL CONTRACTORS FOR MECHANICAL SYSTEMS

Industrial Piping • Power Plants • Heating/Air Conditioning • Plumbing • Air and Water Pollution Control

October 8, 1999

Niagara County Refuse Site
Wheatfield, New York

Re: Niagara County Refuse Site
JWD Job #4368

This letter is written to officially notify Niagara County Refuse Site that the mechanical system installed by John W. Danforth Company has been completed and tested and startup accomplished.

The warranty period for all defects in workmanship, including parts and labor to correct same is from July 1, 1999 to July 1, 2000. Should you encounter any problems please contact our 24-hour service number at (716) 832-2386.

We would like to point out that normal maintenance items such as changing filters, tightening belts, greasing and lubrication are not covered under warranty and are the owner's responsibility. Your operation and maintenance manual prepared by our company lists normal maintenance items in detail.

In closing, we want to express our appreciation for having been selected to install the mechanical system for Niagara County Refuse Site and look forward to a long association.

Sincerely Yours,

Emmett L. Reilly
President

ELR/mam
cc: Service Department

Note:

The warranty period should have extended one year beyond substantial completion (assumed January 25, 2000), not from the date of installation. Haseley has stated in a letter to Parsons, dated July 25, 2000, that their guarantee will cover the slack from Danforth Company.