C&D TECHNOLOGIES, INC.
Power Solutions

POWER SYSTEMS DIVISION

HRT RECTIFIERS
SINGLE-PHASE INPUT
PRODUCT MANUAL

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OBSOLETE - FOR RECORD ONLY

RECEIVING INSTRUCTIONS
&
GENERAL EQUIPMENT INFORMATION

Please Note: For your protection, the following information and the product manual should be read and thoroughly understood before unpacking, installing, or using the equipment.

C & D Technologies presents all equipment to the delivering carrier securely packed and in perfect condition. Upon acceptance of the package from us, the delivering carrier assumed responsibility for its safe arrival to you. Once you receive the equipment, it is your responsibility to document any damage the carrier may have inflicted, and to file your claim promptly and accurately.

1. PACKAGE INSPECTION

1.1 Examine the shipping crate or carton for any visible damage: punctures, dents, and any other signs of possible internal damage.

1.2 Describe any damage or shortage on the receiving documents, and have the carrier sign their full name.

1.3 If your receiving freight bill notes that a Tip-N-Tell is attached to your freight, locate it. If the Tip-N-Tell arrow has turned even partially blue, this means the freight has been tipped in transport. Make sure the carrier notes this on your receipt before you sign for the freight.

2. EQUIPMENT INSPECTION

2.1 Within fifteen days, open the crate and inspect the contents for damages. While unpacking, be careful not to discard any equipment, parts, or manuals. If any damage is detected, call the delivering carrier to determine appropriate action. They may require an inspection.

***SAVE ALL SHIPPING MATERIAL FOR THE INSPECTOR TO SEE!**

2.2 After the inspection has been made, call C & D Technologies. We will determine if the equipment should be returned to our plant for repair, or if some other method would be more expeditious. If it is determined that the equipment should be returned to C & D Technologies, ask the delivering carrier to send the packages back to C & D Technologies at the delivering carrier's expense.

2.3 If repair is necessary, we will invoice you for the repair so that you may submit the bill to the delivering carrier with your claim form.

2.4 It is your responsibility to file a claim with the delivering carrier. Failure to properly file a claim for shipping damages may void warranty service for any physical damages later reported for repair.

3. HANDLING

Equipment can be universally heavy or top-heavy. Use adequate humanpower or equipment for handling. Until the equipment is securely mounted, be careful to prevent the equipment from being accidentally tipped over.

4. NAMEPLATE

Each piece of C & D Technologies equipment is identified by a part number on the nameplate. Please refer to this number in all correspondence with C & D Technologies.

5. INITIAL SETTINGS

All equipment is shipped from our production area *fully checked and adjusted*. Do not make any adjustments until you have referred to the technical reference or product manual.

6. SPARE PARTS

To minimize downtime during installation or operation, we suggest you purchase spare fuses, circuit boards and other recommended components as listed on the Recommended Spare Parts List in the back of the product manual. If nothing else, we strongly recommend stocking spare fuses for all systems.

OBSOLETE - FOR RECORD ONLY

ISSUE HISTORY

ISSUE	PAGE(S)	DESCRIPTION	APPRV'D /DATE
1		Original Issue	?
2	ALL	Changed throughout manual & cover to read "C & D Technologies, Inc. Power Solutions" and/or "C & D Technologies, Inc.". Changed cover to include Dunlap Plant address, phone #'s, fax #'s, web-site address, etc. Added updated Receiving Instructions & General Equipment Information sheet =issue 7 Added Issue History sheet & moved associated drawings located throughout manual to the back for better viewing purposes. See ECN 12770	MCM 2/23/00
3	ALL	SEE ECN 14491	MCM 10/27/03
4	ALL	SEE ECN 15560	MCM 5/30/06

DOCUMENT SUMMARY

This document explains the installation, operational, maintenance and troubleshooting methods for the C&D Technologies HRT Single-Phase Rectifier.

Thank you for purchasing the HRT Single-Phase Rectifier. We at C&D Technologies are proud of the quality of our products and welcome any suggestions to further improve our design to fit your needs.

All statements, information and data given herein are believed to be accurate and reliable but are presented without guarantee, warranty or responsibility of any kind, express or implied. Statements or suggestions concerning possible use of the product are made without representation or warranty any such use if free of patent infringement and are not recommendations to infringe any patent. The user should not assume all safety measures are indicated or other measures may not be required.

TABLE OF CONTENTS

CHAPTER ONE: DESCRIPTION AND OPERATING CHARACTERISTICS

1.1 GENERAL DESCRIPTION

HRT Series, single-phase power supplies are of the controlled ferroresonant type, designed primarily for telecommunications, switchgear and control and related industries that require premium performance.

The main components of an HRT power supply are shown in Figure 1.1. AC input power is applied through a circuit breaker to the power transformer. In addition to serving as an on-off switch for the power supply, the AC circuit breaker provides overcurrent and fault protection for the unit in case of short circuits or other malfunctions on the input side of the unit.

The ferroresonant transformer has its input coil on the same leg of the core as the resonant winding. The resonant winding, together with the resonant capacitor, maintains the core at a high magnetic flux density, keeping output voltage fairly constant with respect to input voltage. The high reactance of this type of transformer provides protection against overload and short circuit of the output.

To further improve output voltage regulation of the ferroresonant transformer with respect to changes in load and input frequency, HRT power supplies use the C&D controlled-ferro technique, which precisely controls the level of magnetic flux density in the core. This technique shunts the resonant circuit with a triac in series with an inductor.

Located on the unit control board, an electronic voltage/current control senses the start of the resonant capacitor charge cycle. It also monitors output voltage and compares it to a reference voltage. The resulting error signal determines when the triac turns on to interrupt the capacitor charge cycle to maintain core flux at the desired level.

Circuitry to limit output current in also located on the control board. When output current exceeds a present level a proportional signal, developed the ammeter shunt, overrides the voltage regulator to maintain output current at the preset level. If a fault occurs, causing extremely high output voltage, it is sensed by a high voltage shutdown circuit, which trips the ac breaker, turning the power supply off. If HVS does not operate, a redundant mode forces the triac on to shut the charger down.

A power rectifier, consisting of silicon diodes arranged in a full-wave circuit, converts ac voltage from the transformer to dc voltage. The output of this rectifier is filtered and supplied to the battery and load through a dc circuit breaker.

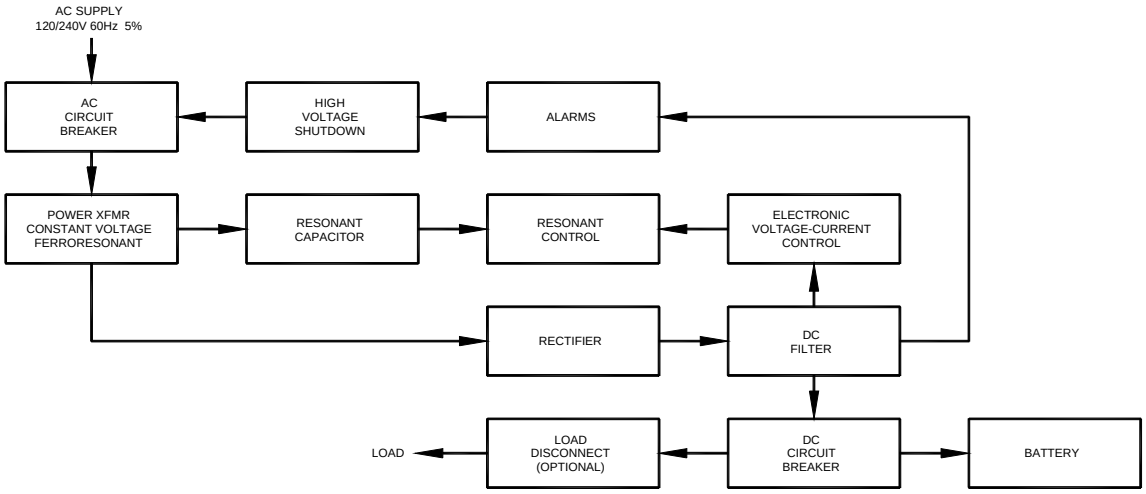


FIGURE 1.1 Block Diagram

1.2 SPECIFICATIONS

The following specifications are the HRT Series line of controlled ferroresonant power supplies. Individual units are supplied with their own particular specifications.

INPUT

Voltage:	120/208/240 V, single-phase, field-changeable.
Frequency:	57 to 63 Hz; 60 Hz nominal
Input Noise:	Within requirements NEMA PE-7, for telecommunications and NEMA PA-5 for utility.
Audible Noise:	Less than 65 dB, A-weighted and measured at five feet from a vertical surface in a nonreflective environment.

OUTPUT

Rated Voltage:	2.15 volts/cell times the number of series-connected lead-acid cells for which unit was designed plus one volt. Float and equalize voltages are continuously adjustable (no taps) over the nominal voltage range of 2.00 to 2.35 volts per cell at reduced output.
Voltage Regulation:	$\pm$ 0.5% for float operations and $\pm$ 1.0% for equalize operation for all variations of line and load; $\pm$ 0.5% for temperature change with constant line and load conditions.
Noise:	22 dBrnc maximum when connected to a battery of Ah capacity equal to four times rated output current; 30 mV RMS maximum in a frequency band of 10Hz to 4 MHz; 200 mV or one percent of output voltage, peak-to-peak, maximum.
Current Limit:	105% rated current (102% for the HRT 48AC50E), maximum.

CHAPTER TWO: RECEIVING AND INSTALLATION

2.1 IDENTIFICATION

The model number of an HRT power supply describes its basic operating characteristics. Knowing these characteristics is essential to proper operation and maintenance and to expected service life and coverage under warranty. Read the following codes, explanation and examples carefully. When requesting information or ordering spare parts, please specify the model, serial and specification number, as shown on the equipment nameplate.

HRT 48AC 100 E

HRT – Model line designation

48 – Nominal dc output voltage

AC – 120/208/240 Vac input

100 – Rated dc current

E – Telecommunications battery eliminator

or

U – Utility battery eliminator

2.2 UNPACKING AND HANDLING

HRT models in the 12-¼ inch cabinet are shipped in a carton, with the back panel of the unit on the bottom of the carton. All other models are shipped upright, bolted to a pallet with a carton dropped over the unit and banded to the pallet. All units may be handled with a hand truck or forklift truck. It is recommended that units be moved to their locations before removing the packing materials.

To remove the 12-¼ inch units from the carton, cut the tape that seals the carton, remove the protective inserts, and lift the unit out of the carton. To unpack all other units, cut the bands holding the carton to the pallet and lift the carton off the unit. Remove packing materials from around the cabinet. Remove the bolts holding the power supply to the pallet. **CAUTION: When cutting bands, hold the banding to prevent it from whipping out towards you.** Remove the unit from the pallet and move it to its mounting location, using a suitable lifting device. Move the unit by the lifting eyes at the top of the unit or from the bottom of the unit.

IMPORTANT: *Check packing materials for packing slip and other information.*

Carefully inspect the power supply for loosened connections or mountings, dislodged circuit boards, and other disruptions that might have occurred during shipping. Report problems as soon as possible to your C&D representative.

2.3 STORAGE

If you are not going to use the power supply immediately, store it (fully packed, if possible) in a clean, dry place, protected from physical damage, airborne contaminates and moisture. HRT power supplies may be stored safely for up to one year at temperatures of -40 F (-40 C) to +185 F (85 C) an relative humidity of five percent to 95 percent, noncondensing.

2.4 LOCATION AND MOUNTING

Install power supplies in a cool clean, dry place, protected from overhead drip. Avoid locations that would subject the equipment to extreme vibration, which could cause malfunctions. Also provide adequate ventilation to remove heat. Environmental operating limits for the HRT power supply are as follows:

Ambient temperature:	32 F (0 C) to 122F (50 C)
Relative humidity:	zero to 95 percent, noncondensing
Altitude:	Maximum rating to 3,300 ft (1,000 M); derating above. Maximum operating altitude 10,000 ft (3000 M)

HRT power supplies may be mounted on relay racks, walls and, in some cases, floors. To mount a unit to a wall, remove brackets from middle of cabinet and reinstall them at the rear. Brackets are available from C&D for floor mounting.

2.5 AC POWER REQUIREMENTS

Nominal voltage of the ac source must match that of the HRT power supply. Check the card supplied to see that the primary transformer is connected for the incoming ac line voltage. If it is not, refer to the wiring diagram associated with your rectifier.

For the power supply to function properly, ac supply voltage must be within the following ANSI Standard ranges:

VOLTAGE, ALTERNATING CURRENT		
NOMINAL	MINIMUM	MAXIMUM
120	106	127
208	184	220
240	212	254

If sustained voltage fluctuations are beyond these ranges, contact the C&D Field Service Department at 1-800-299-3907.

2.6 CONNECTIONS

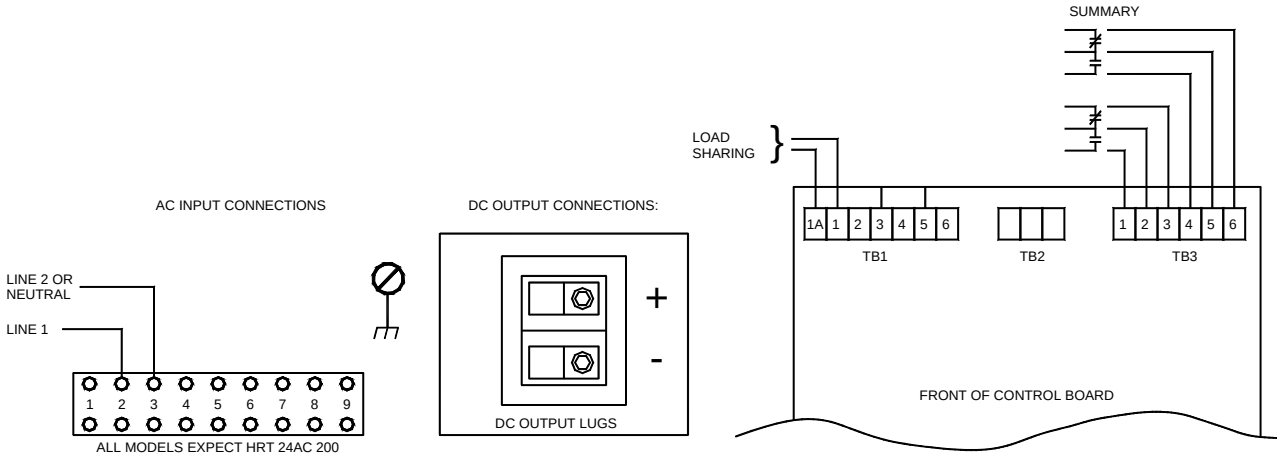
CAUTION: Be sure the dc breaker is "OFF" and that positive-to-positive and negative-to-negative polarity are observed when connecting battery to power supply. In all installations using a battery, connect the load to the battery terminals, not to the power supply.

IMPORTANT: This equipment must be installed by competent personnel who are familiar with both local and national electrical codes.

All connection terminals are within the power supply cabinet and may be reached by removing the door panel and opening the hinged instrument panel at the front of the unit. The location of input and put out power connections are shown in Figure 2.2. Conduit holes for power cables are provided in the tip panel. Knockouts or covered access holes are provided in the sides.

The HRT power supply should be connected either to a fused ac disconnect switch or to an ac circuit breaker. Before selecting the rating of the protective device and the size of ac and dc cables, check the equipment nameplate or "Specifications" in Section 1 for rated currents.

In sizing cables and protective devices, follow the National Electrical Code (NEC) or other acceptable standard. In all cases, cable ampacities and protective device ratings must be equal to or greater than the ratings of the power supply circuit breaker.



The ac terminal block is oriented vertically in the HRT24AC200. The terminal numbering is identical to the HRT48AC100.
The dc terminal block for the HRT24AC200 is oriented vertically, with the positive terminal to the left and the negative terminal to the right.

TB1 - Terminal block for load sharing
TB2 - HVSD Customer Alarm Connection
TB2 - Pin 1 - NO
TB2 - Pin 2 - C
TB2 - Pin 3 - NC

TB3 - Connection block for customer summary alarm - HVSD, HVA, LVD, and NCA alarms
TB3 - Pin 1 and Pin 4 - NO
TB3 - Pin 2 and Pin 5 - C
TB3 - Pin 3 and Pin 6 - NC

FIGURE 2.2 – Connection Diagram

2.7 VOLTAGE CHANGEOVER

HRT Power supplies without preset ac input voltage connections may be connected to 120, 208, or 240 Vac by using jumpers as shown on appropriate drawings in Chapter 7.

CAUTION: When making a voltage changeover, DO NOT reposition any wires except the jumper wires on the voltage changeover terminal block. (See Wiring Diagrams located in back of manual)

2.8 GROUNDING

This power supply must be securely grounded to protect operating and service personnel. The ground system must be designed to eliminate ground divergence from occurring and meet the requirements of the National Electric Code (NEC). For installation convenience a ground terminal (labeled “GND”) is provided.

2.9 FUNCTIONAL TEST

If possible, before permanently mounting the power supply and placing it in service, conduct the following tests to see if the unit is operating correctly.

PROCEDURE

1. Ground the unit and connect it to an ac source and dc load, as described above. For acceptance testing, dc load can be smaller than specified operating load. Open the ac and dc breaker.

2. Close the ac breaker.

3. Referring to drawings in back of manual, set the float/equalize rocker switch so the float LED indicator is lit and unit is in float mode. Set the remote/local slide switch to "LOCAL" position.. If the unit is operating properly, the following LED indicators will be lit:
   - "AC ON"
   - "RECT FAIL"
   - "NCA

   The ammeter will read zero and the voltmeter will display the float voltage specified on the equipment order, or if a voltage is not specified, the voltage reading will be 2.20 times the number of lead-acid cells for which the unit was designed.

4. Set the float/equalize switch so equalize LED indicator is lit and unit is in equalize mode. The voltmeter will display the equalize voltage specified on the equipment order, or if a voltage is not specified, the voltage reading will be 2.33 times the number of lead-acid cells for which the unit was designed.

   NOTE: If the unit has an option board, the unit may go into equalize for the period set on the timer.

5. Set the float/equalize switch so the float LED indicator is lit and unit is back in float mode. Close the dc breaker. Adjust the dc load to about 10 percent of the power supply rating. If the unit is operating properly, the "NCA" LED indicator will go out; the voltage will be the desired float voltage and the ammeter should display the dc output current.

6. Open ac and dc breakers. The acceptance test is finished.

CAUTION: DC output cans may still be charged after breakers are opened.

If you did not obtain the results described above, repeat the entire test in sequence. If the unit still does not respond contact you local C&D representative for assistance.

CHAPTER THREE: OPERATION AND MAINTENANCE

3.1 TURN-ON PROCEDURE

After making all connections to the power supply and checking them for tightness use the following procedure to energize the equipment:

1. Place the float/equalize rocker switch in the float position and set the local/remote switch to local.

2. Close the ac circuit breaker. Wait several seconds for the dc voltage to reach its set point.

3. Close the dc circuit breaker. If inrush of current trips the dc breaker, reset it and proceed. Refer to drawings in back of manual for location of switches.

> **NOTE:** Float and equalize voltage levels are factory-set and are shown on a red card attached to the inside of the front panel. If you wish to change these settings for your application, please refer to section 3.3, "Service adjustments".

The following are *typical* float and equalize voltages, on a per-cell basis for different types of batteries. Refer to the battery manual for cell voltage recommendations.

Table 1

TYPICAL FLOAT/EQUALIZE VOLTAGES

BATTERY TYPE	CELL VOLTAGE FLOAT	EQUALIZE
LEAD-ANTIMONY (1.210 Specific gravity)	2.15-2.17	2.33
LEAD-CALCIUM (1.210 Specific gravity)	2.17-2.22	2.33*
NICKEL-CADMIUM	1.43	1.55
NICKEL-IRON	1.50-1.55	1.60-1.65
LEAD-ACID VALVE-REGULATED (SEALED)		
(1.300 Specific gravity)	2.25-2.30	*
(1.290 Specific gravity)	2.25-2.30	*
(1.245 Specific gravity)	2.17-2.22	*

*Additional equalize charging is not normally recommended after initial charge. Consult battery manufacturer or your battery manual for further recommendations.

3.2 OPERATOR ADJUSTMENTS

The following two adjustments do not require the special knowledge and skills of a technician. They can be made externally, without access to the inside of the equipment.

3.2.1 Float voltage, operating

The setting of the float potentiometer FL on the front panel determines the float voltage level, provided the float/equalize rocker switch is in the float position. Turning the potentiometer clockwise increases float voltage. Turning it counterclockwise decreases float voltage.

To adjust float voltage correctly, the battery should be fully charged with some load connected. Adjust the float potentiometer only while the power supply is operating. Be sure the actual output current is less than the rated output current.

3.2.2 Equalize voltage, operating:

The setting of the equalized potentiometer EQ on the front panel determines the equalize voltage level, provided the float/equalize rocker switch is in the equalize position. With the power supply operating, turn the potentiometer to adjust equalize voltage. Increases by turning clockwise; decrease by turning counterclockwise. The equalize setting depends on the kind of battery connected (as shown in Table 1 and on the maximum limiting voltage of the connected load equipment.

> **NOTE:** If lead-calcium batteries are connected, equalize and float voltages typically have the same setting, since lead-calcium cells normally require no equalize charging. Consult your battery manufacturer for more information.

3.3 SERVICE ADJUSTMENTS

CAUTION: Operating an HRT power supply at more than it's rated current is not recommended. The current limit setting should not be greater than 105 percent for all models, except the HRT 48AC50E. The HRT48AC50E current limit should not be set greater than 102 percent.

IMPORTANT: All of the adjustments described below require access to the interior of the power supply enclosure. They must be performed by a qualified technician who is familiar with the HRT power supply and with electrical safety procedures.

CAUTION: Lethal voltages are present within this equipment. Please DO NOT perform tests or adjustments that can not be done safely.

NOTE: If either float or equalize coarse adjustments are made, the current limit must also be checked and adjusted as required.

If the voltage on a replacement board will not adjust, the current limit adjustment may be turned fully counterclockwise. If so turn the current limit clockwise several turns, then adjust the voltage. Be sure to reset the current limit as part of servicing the unit.

3.4 CURRENT LIMIT:

The current limit is factory preset to 105 percent of the rated current, except for the HRT48AC50E that is set to 102 percent of the rated current. If a lower limit is desired, it may be set within a range of 50 percent to 105 percent of the dc rated output, except the HRT48AC50E which is with a range of 60 percent to 102 percent of the rated dc output, using potentiometer R49 on the control board.

Potentiometer R49 is labeled "CL" and is located on the bottom edge of the control board. Clockwise turning increases the current; counterclockwise turning decreases it. To adjust the current limit, follow one of the procedures below.

If dummy load is available, then:

1. Increase load until it exceeds the desired set point.
2. Turn "CL" slowly counterclockwise until you reach the desired setting. For example, to set a 90 percent current limit on a power supply rated at 30 amps, stop turning when you reach 27 amps.
3. Remove dummy load.

If dummy load is not available but some system load is, then:

1. Open the ac circuit breaker.
2. Allow battery voltage to drop to about 90 percent of float voltage. This will discharge the battery enough to make the power supply operate in the current limit mode when it is turned on again.
3. Close the ac breaker.
4. Turn "CL" slowly until the desired setting is reached.

NOTE: Current limit on replacement boards may be fully counterclockwise. This is not a sign of a defective board.

3.5 HIGH-VOLTAGE ALARM (HVA)

CAUTION: Do not exceed maximum system bus voltage when setting or checking this function.

Description: The high-voltage alarm monitors dc output voltage and activates local and remote alarms when voltage raises beyond a preset level. The HVA remains activated as long as a high-voltage condition exists.

Preferred method of adjustment: Set the high-voltage alarm by turning potentiometer R41 (labeled "HVA" on control board) clockwise to increase the alarm trip level voltage, counterclockwise to decrease it. To adjust the HVA, connect a high-impedance voltmeter between TP1 and J3-12. Set the power supply to the equalize mode and adjust equalize voltage to the desired HVA trip limit. Turn R41 counterclockwise until the voltage reading is zero. Then, turn it slowly clockwise until voltage increases to about 15 volts. The alarm voltage level is now set.

Alternate method of adjustment: Set the power supply to the equalize mode and adjust equalize voltage to the desired alarm trip level voltage. Turn R41 clockwise until the HVA LED indicator turns off. Then, turn it very slowly counterclockwise until the HVA LED lights up again.

NOTE: The HVA LED indicator on the front panel will not light at the same time as the 15-volt level is reached because of a time delay in alarm operation.

To check the HVA trip level setting to the power supply to equalize, and while monitoring the output voltage, very slowly increase the output voltage until the alarm is activated.

IMPORTANT: Reset the equalize potentiometer after adjusting the HVA.

3.6 HIGH-VOLTAGE SHUTDOWN (HVSD)

CAUTION: Do not exceed maximum system bus voltage when setting or checking this function.

Description: The high-voltage shutdown monitors the dc output voltage and turns the power supply off if the voltage exceeds a preset level, protecting both load and power supply. The HVSD works by energizing a trip coil on the ac input circuit breaker. After it has been activated and as long as voltage is present on the output, the HVSD lights a blinking LED indicator on the front panel. This shows the reason for the power supply shutdown. The function is reset by opening the dc breaker, until the LED stops flashing. The power supply may now be restarted by closing the ac breaker, followed by the dc breaker 15 seconds later.

NOTE: If the HVSD continues to shut down the power supply, refer to "Adjustment" below or to the "Troubleshooting" section of this manual. The HVSD cannot operate when the no-charge alarm (NCA) is energized.

Preferred method of adjustment: Set the HVSD by turning potentiometer R52 (labeled HVS on control board) clockwise to increase trip level voltage, counterclockwise to decrease it. To adjust, connect a high-impedance voltmeter from TP9 to J3-12. Set the power supply to the equalize mode and adjust the equalize voltage to the desired HVSD trip level. Adjust the HVSD by turning R52 clockwise until the voltage rating is zero. Then, turn it counterclockwise until the voltage increases to about 15 volts. This sets the trip level. **NOTE**: By performing the above adjustment at zero output current, the HVSD trip level may be set without the power supply tripping off.

If the HVSD LED indicator does not flash and the ac circuit breaker trips consult the troubleshooting section.

IMPORTANT: RESET THE EQUALIZE POTENTIOMETER AFTER ADJUSTING THE HVSD.

NOTE: For valve-regulated (sealed) batteries, the HVS should be set for 2.40 volts per cell.

3.7 SECONDARY HIGH-VOLTAGE SHUTDOWN (HVSD)

Description: The secondary high-voltage shutdown (HVSD) monitors the dc output voltage and turns off the power supply if the voltage exceeds a factory-set limit for approximately three seconds. The secondary shutdown works by energizing the trip coil in the ac circuit breaker and by turning the triac on. When active, the LED on the circuit board is illuminated. The NCA does not affect the operation of this protection circuit board, which is mounted either to a bracket on the bottom or top of the power supply or to the left wall of the cabinet.

To reset the protective circuit, the ac circuit breaker and the dc circuit breaker must be opened and the output filter capacitors totally discharged (0 volts dc output).

Adjustment: The protective circuit is factory set at 30.7 volts for a 12-cell unit or 61.2 volts for a 24-cell unit, $\pm$ 0.2 volts. The level is not field-adjustable.

3.8 LOW-VOLTAGE ALARM (LVA)

Description: The low–voltage alarm monitors dc voltage and activates and LED indicator when voltage falls blow a preset limit. The LVA will operate as long as a battery or other voltage source is present – even if the power supply is shut down or the ac source has failed.

Preferred method of adjustment: To set the LVA, turn potentiometer R42 (labeled "LVA" on control board) clockwise to increase or counterclockwise to decrease the trip voltage level. To adjust, connect a high-impedance voltmeter between TP-8 and J3-12. Set the power supply to the equalize mode and adjust equalize voltage to the desired alarm voltage. Turn R42 clockwise until the voltage drops to zero. Then, turn it slowly counterclockwise until the meter reads 15 volts. The LVA level is now set.

> **NOTE:** The front panel LVA LED indicator will not light at the same time the 15-volt level is reached because of a time delay in alarm operation.

Alternate method of adjustment: Set the power supply to equalize and adjust the equalize voltage to the desired level. Turn R42 clockwise until the LVA LED indicator goes off. Then, turn it very slowly counterclockwise until the LED lights again. The alarm level is now set.

To check the LVA setting, slowly adjust the equalize voltage from above to below the desired alarm voltage. Or, set the power supply to "Float", close the ac breaker, and partially discharge the connected battery. Monitor the output voltage until the desired alarm voltage is reached.

IMPORTANT: RESET THE EQUALIZE POTENTIOMETER AFTER ADJUSTING THE LVA.

3.9 NO-CHARGE ALARM (NCA)

Description: The no-charge alarm is a low-current alarm. It monitors power supply output current and activates local and remote alarms when this current drops below a preset level. NCA operation prevents operation of the HVSD. It also disconnects load-sharing circuitry from power supplies, which are connected in parallel. Do not set the NCA to less than two percent of the rated output of the power supply.

Preferred method of adjustment: To set the NCA turn potentiometer R47 (labeled NCA on the control board) counterclockwise to increase the current level. Clockwise to decrease it. With the power supply operating, load the power supply to obtain the desired current for the alarm to operate. For currents above the desired current, the alarm is inactive. For currents below the desired current, the alarm is active. Turn R47 counterclockwise until the NCA LED indictor goes off. Then turn it slowly clockwise until the LED lights again. The NCA is now set.

Alternate method of adjustment: With batteries and load connected, adjust the power supply voltage until the output current is the desired operating current for the alarm. Currents above the desired operating current leave the alarm inactive. Currents below the desired current activate the alarm. Turn R47 counterclockwise until the NCA LED indicator goes off. Then, turn it slowly clockwise until the LED lights again. You may need to readjust power supply voltage during this procedure as the load discharges the batteries.

To check the NCA setting, adjust either the load or the output voltage so power supply current drops below the alarm set point. Note current at which alarm operates.

IMPORTANT: RESET OUTPUT VOLTAGE LEVELS AFTER ADJUSTING THE NCA.

> **NOTE:** Setting the NCA too low may result in HVSD operation.

3.10 GROUND FAULT ALARM [± GRND] (UTILITY)

Description: The ground fault alarm indicates if a substantial current path is present from an output lead to the ground. The presence of a current path will activate the appropriate LED.

Adjustment: The sensitivity level of the alarm is selectable between either 1 mA or 5MA by J7 and J8. For 1 mA sensitivity, place the shorting jumpers of pins 2 and 3 of J7 and pins 2 and 3 of J8. For 5 mA sensitivity, place the short jumpers on pins 1 and 2 of J7 and pins 1 and 2 of J8. Removing the jumpers and not replacing them on the appropriate pins will result in a 1mA sensitivity.

3.11 LOAD SHARING

Description: Load sharing allows two or more HRT power supplies connected in parallel to share a load in proportion to their ratings, HRT power supplies will share a load within five percent of the rating of the largest unit between 10 percent and 100 percent of their ratings.

Connection: Connect all load sharing power supplies to the system bus, using equal lengths of properly sized cable from the output of each unit. Connect a #18 AWG insulated wire from TB1-1 on the HRT control board to the appropriate terminal in the other unit.

Adjustment: For each power supply, remove connections to TB1-1 and energize only that unit. Set output voltage in both float and equalize mode to the desired levels. Use a digital dc voltmeter for this adjustment. Connect the dc voltmeter between TB1-1 and J3-12.

With no load on the power supply, adjust the load share control (R43) to obtain 5.00 volts on the TB1-1 terminal. Individually adjust all other HRT power supplies in the same manner.

For two power supplies: reconnect the #18 AWG wire between the two units. Energize both units. Add some load to the system and adjust R43 on the unit with the lower output current until the load share control matches the output current of the other unit. For best results, the load should be between 50 percent and 100 percent of the combined rating of the two power supplies.

For more than two power supplies: Energize two units and adjust them as described above.

> **NOTE:** Only the units operating should have any connections to the TB1-1 terminals. For each additional unit set the unit as described in the paragraph "Adjustment," above. Then add additional units, one at a time, connecting the #18 AWG wire to TB1-1 from the units already load sharing and adjustment R43 (load share control) on each added unit until all units are balanced and sharing the load. For best results, the system load should be between 50 percent and 100 percent of the combined rating of the operating power supplies.

Operational notes – load sharing:

1. Load sharing is not intended to be effective below 10 percent of the sum of the rectifier-rated output. Operation below 10 percent load may cause unequal outputs or loss of output current from one of the paralleled units. Where paralleled units are used to load a battery before the system load is installed. We recommend only one power supply be operated.

2. Occasional minor changes in the power supply output current may occur when paralleled units are operated at light loads. This indicates the transfer of small currents between units and does not affect the load.

3. If output voltages are misadjusted, oscillation or “hunting” may occur. To remedy this, energize only one unit at a time and adjust its output voltage to the desired level using a digital voltmeter.

3.12 RECTIFIER FAIL (RECT. FAIL)

The rectifier fail is not user adjustable. It is activated by the individual alarms: the high-voltage shutdown, no-charge alarm, and loss of ac power. The summary alarm relay is operated with the rectifier fail. The summary alarm relay is de-energized by an alarm condition. Alarm contact connections are made via the screw terminals a TB3 on the control board.

3.13 MAINTENANCE

CAUTION: Before performing any maintenance, shut off ac input power and disconnect the battery from the power supply. Also discharge filter and resonant capacitors if required.

The HRT power supply is designed to provide years of trouble-free service. To obtain optimum performance, we recommend you perform the following preventive maintenance and inspections periodically:

- Good ventilation is essential to power supply operation. Check the area around the unit to assure nothing interferes with the free movement of cooling air around internal components.
- Clean equipment operates cooler and performs better. Blow out the power supply periodically with dry, low-pressure air to remove built-up dust.
- Check all connections at least twice a year for tightness. Clean and retighten as necessary.
- Check ac and dc capacitors for leakage, case or seal rupture, and screw tightness. DC capacitors more than five years old or showing signs of degradation should be removed and checked for excessive leakage current and replaced if necessary. (Refer to Chapter 4: Troubleshooting)
- Float and equalize voltages should be checked and adjusted as described at the beginning of this section.
- Excessive overloads may damage the power supply. Check the current limit periodically as described in “Current limit” above.
- Check panel meters periodically against portable standards.

CHAPTER FOUR: TROUBLESHOOTING

4.1 PROCEDURE

The chart below is designed to help a qualified technician diagnose the causes of power malfunctions and remedy them in a logical and efficient manner. Use it with the component location drawings and wiring and schematic diagrams that follow in Chapter 7. A section on "Checking components," also in this section, will help you diagnose a repair malfunctions in specific components.

SERVICE NOTE: To check power circuit:

1. Disconnect control board.
2. Open the dc circuit breaker.
3. Close the ac circuit breaker.

If power circuit is functioning properly, the unit will deliver dc voltage. If this does not occur, follow the appropriate procedure in the troubleshooting chart below.

WARNING: Lethal voltages are present within an HRT power supply. For your own safety, before attempting any of the following procedures, disconnect both the ac power source and the battery, and discharge the filter and the resonant capacitors if required. If a particular check requires ac or dc power, or both follow carefully the specific procedures for that test.

4.2 TROUBLESHOOTING CHART

TROUBLESHOOTING CHART

Problem	Possible Causes	Solutions
AC breaker trips	1. Short in ac power circuit	a. Inspect primary wiring for shorts or ground connections
	2. Input connected for wring voltage	a. Check position of jumpers on voltage changeover diagram, Fig. 2.6
	3. High-voltage shutdown is operating	a. Remove load and check for high voltage
	4. Secondary high-voltage shutdown is operating	a. Check for high voltage b. Defective shutdown board
	5. Input voltage is outside ANSI range	a. Measure input voltage
	6. AC frequency is less than 57 Hz	a. Check input frequency
	7. Short in power transformer winding	a. Inspect transformer primary for signs of overheating

TROUBLESHOOTING CHART (continued)

Problem	Possible Causes	Solutions
No dc output (current or voltage) ***Note:*** *Panel voltmeter maybe defective --- Check voltage at output terminals using portable meter.*	1. AC power outage	a. Check ac voltage on both sides of breaker
	2. DC breaker open	a. Check dc breaker b. With unit operating, load connected and breaker closed, voltage across breaker should be zero.
	3. Short in dc power circuit	a. Check secondary power wiring and terminals for shorts or grounded connections b. Check power rectifier diodes c. Check for shorted dc filter capacitors
Low dc output voltage ***Note:*** *Panel voltmeter may be defective --- check voltage at output Terminals using portable meter.*	1. Short in resonate circuit	a. Check triac b. Check resonant capacitor c. Check resonant circuit wiring
	2. Open sensing lead	a. Check wiring for continuity
	3. Unit in current limit	a. Adjust current limit potentiometer
	4. Component failure in control board	a. Replace control board
	5. Voltage misadjustment	a. Adjust float potentiometer b. Adjust coarse voltage setting on control board. (Telecommunications only.)
	6. Secondary shutdown is activated	a. Remove load and check for high voltage b. Defective shutdown board
High dc output voltage	1. Open triac in resonant circuit	a. Check triac
	2. Open sensing leads	a. Check for dc voltage between J3-9 and J3-12 on control board. (2.55V nominal)
	3. Control board failure	a. Replace control board
DC breaker trips	1. Battery connection reversed	a. Check polarity of battery connections
	2. Short in dc power circuit	a. Check secondary power wiring and terminals for shorts or grounded connections b. Check power rectifier diodes c. Check dc filter capacitors
Excessive output current	1. No current limit	a. Current limit improperly set b. Check shunt/control board connections c. Failed component in control board; replace control board

TROUBLESHOOTING CHART (continued)

Problem	Possible Causes	Solutions
Excessive ripple or electrical noise	1. Loose filter connections	a. Check unit wiring and bus bars for loose or corroded connections
	2. Defective filter capacitor	a. Check filter capacitors
	3. Open power diode	a. Check power diodes
	4. DC cable routing (excessive noise)	a. Check for broken cable
	5. Improperly-sized battery	a. Check battery rating
No output current	2. Load sharing misadjustment	a. Adjust load sharing b. Readjust input voltage and load sharing c. Insufficient load for load sharing
	3. Paralleled charger supplying all load current	a. Readjust output voltage and load sharing b. Insufficient load for load sharing
	4. Dc ammeter or shunt defective	a. Check and replace, if necessary
Oscillations or poor regulation	1. Loose connection	a. Check circuit boards, connectors, and wiring for poor contacts
	2. Defective triac	a. Replace triac
	3. Component failure in control board B	a. replace control board
	4. Open power diode	a. Check power diodes; replace as required
	5. Resonant capacitor not Grounded	a. Check ac capacitor case to ground with ohmmeter
Low output current	1. Loose connections	a. Check wiring
	2. Open power diode	a. Check power rectifier diodes; replace as required
	3. Unit in current limit	a. Adjust current limit to proper setting b. Replace control board
Acoustic noise	1. Loose laminations	a. Check air gap areas of power trans-former and control reactor with insulated screwdriver
	2. Cabinet vibration	a. Check welds and bolted joints
Ground lights OFF with ground on battery *(Utility models only)*	1. DC breaker open	a. Close unit
	2. Control board not grounded	a. Ground unit b. check ground from control board to instrument panel to cabinet
	3. Sensitivity jumpers set wrong	a. Set jumpers on J7 and J8 correctly
	4. Detention level too high	b. Set board for 1 mA
	5. Control board defective	a. Replace control board
	6. Option board installed wrong	a. Check option board installation

4.3 CHECKING COMPONENTS

CAUTION: Before performing the following test, disconnect both the ac power and the battery. Also discharge filter and resonant capacitors if required.

NOTE: Replace defective components with exact duplicates only. Refer to Chapter 6 for part numbers.

4.3.1 Diodes

Isolated diode from circuit be removing one of its connections. Then test with ohmmeter, using either 10X or 100X scale. A good diode will show low resistance in one direction, very high resistance in the other. A short-circuited diode will show no resistance or very low resistance in both directions. An open diode will show very high resistance in both directions.

4.3.2 Capacitors:

Isolate capacitor from circuit by disconnecting both of it's leads. Test with an analog ohmmeter reversing leads for each check. Scale range depends on size of capacitor and type of ohmmeter used. Start with highest range and work downward. A good capacitor will show a defection toward zero resistance initially, then a steady increase toward infinite resistance. A short-circuited capacitor will show zero resistance. An open capacitor will show infinite resistance.

4.3.3 Resistors:

Isolate resistor by disconnecting both of its leads. Test with ohmmeter, starting with lowest scale and increasing upward. A good resistor will show a specified resistance. A short-circuited resistor will show zero resistance. An open resistor will show infinite resistance.

4.3.4 Resonant Triac:

To check for short circuit, remove one connection and test with ohmmeter, using either 10X or 100X scale, A short-circuited triac will show no resistance or very low resistance in both directions. However, a high resistance in both directions does no necessarily mean that a triac is open.

To check for turn-on, remove one connection. Connection the positive lead of an analog ohmmeter to the triac anode and the negative lead to the cathode. The triac should read open or high resistance. Connect the gate to the anode with a jumper. A low resistance indicates that the triac is turning on.

4.3.5 Circuit Boards:

None of the components on a circuit board were designed for field repair. Defective circuit boards should be replaced. See Chapter 6.

CHAPTER FIVE: OPTIONAL EQUIPMENT

5.1 OPTION BOARD (TELECOMMUNICATIONS)

The option board provides an equalize timer, alarm contacts and load sharing interfacing on one circuit board. The load sharing interfacing allows the HRT Series units to be connected with units, such as ART Series, which have the load sharing output referenced to the positive output lead. To install an option board, refer to the table below:

Model	Drawing
HRT24AC25E	MBC-5544
HRT24AC50E	MBC-5544
HRT24AC100E	MBC-5332
HRT24AC200E	MBC-5471
HRT24AC15E	MBC-5544
HRT48AC30E	MBC-5544
HRT48AC50E	MBC-5332
HRT48AC100E	MBC-5333

5.2 ALARM CONTACTS (TELECOMMUNICATIONS)

The alarm contacts are accessible through the terminals on the right side of the circuit board. The terminals are spring loaded. By pushing the orange tab to the left (total travel is approximately 0.09 inches), the terminal will open to release or receive a stripped wire. The wire size range is 26-14 AWG. Normally open and normally closed contacts are provided for no-charge alarm (TB2. NCA), low-voltage alarm (TB6, LVA), high-voltage alarm (TB7, HVA), and ac on (TB8, PWR).

The alarm contact position for alarm conditions are:

Alarm	Relay Operations
AC power	De-energized by alarm conditions
HVA	Energized by alarm conditions
LVA	De-energized by alarm conditions
NCA	De-energized by alarm conditions

5.3 REMOTE CONTROL (TELECOMMUNICATIONS)

Remote control of the float or equalize mode is available through TB5, remote equalize. The contact should be rated for 1 mA, 5-volt operation. To use this feature, remove the jumper from TB5 and connect the remote control contacts to these terminals.

For remote control of the output mode the local/remote selector switch must be in remote position. With the switch in this position, the output mode is controlled by the option board and contact status presented to TB5. C closed contact selects float mode for the rectifier, and an open contact selects equalize mode. If the remote control contact is not used a jumper must be place between theTB5 terminals as originally provided. If the option board equalize timer (described on Page 19) is in equalize mode, the remote contact status is ignored. To assure proper operation, a jumper or the remote control contacts must be connected to TB5.

5.4 EQUALIZE TIMER (TELECOMMUNICATIONS)

The equalize timer function is activated by changing the local/remote selector switch from local to remote. This action initiates only one timer cycle. If the HRT is already set to remote, rock the switch from remote to local to remote. When activated, the unit operates in equalize mode for the number of hours selected via S2 and S3, plus an additional six minutes. Operation of the remote control contacts connected to RB5 will not initiate a timer cycle.

The switches S3 and S2 select the desired number of hours for the equalize timer cycle. Setting the switches should only be done by qualified service personnel. Any period from 00 to 99 hours may be set. For periods less than 10 hours, S3 is set to "0" and S2 is set to the desired number of hours.

External events can affect the equalize timer function. Without a battery connected to the unit, an ac power failure will terminate the equalize timer cycle. With a battery connected to the unit, an ac power outage will stop the timer for the duration of the outage. When ac power is restored, the timer will resume operation. Changing the local/remote switch from remote to local puts the rectifier in the mode selected via the float/equalize switch. Returning the switch to remote activates the timer as described above. If the TB5 terminals (described above) are connected to open contacts or are otherwise not shorted together, the HRT will remain in equalize mode after the timer cycle is finished. To assure proper operation, a jumper or remote control contacts must be connected to TB5.

5.5 LOAD SHARING (TELECOMMUNICATIONS)

CAUTION: All units connected in load sharing via the option board MUST have their load sharing output referenced to the positive output leads of the units.

WARNING: Improper connection of the load sharing can damage the rectifiers and may result in personal injury.

The load sharing circuitry on the option board is intended for use with C&D rectifiers, which are not HRT Series or HF Series. Al load sharing connection between HRT Series or HF Series units should be made on the control board on TB1 or TB1-1a. All load-sharing connections to all other types of C&D power supplies must be made on TB1 of the option board.

Upon installation, J4 should be set to the nominal output voltage of the rectifier. The jumper J3 should be set to either the "C&D POWER SUPPLIES" position on the "+" position.

Adjustment: Set the LS voltage on control boards. With ac and dc circuit breaker off, disconnect ribbon cable from J1 on the option board. Disconnect any wires connected to TB1–1 or TB1 –1a on the control board and energize only that unit. Set the output voltage in both float and equalize mode to the desired level. Use a digital voltmeter for the adjustment. Connect a dc voltmeter between LS (TB1-1 or TB1-1a) on the control board and negative voltmeter jack. With no load on the HRT, adjust the load share control (R43) on the control board to obtain 5.00 volts on the dc voltmeter. De-energize the power supply and reconnect the ribbon cable to J1 on the option board. Connect a voltmeter between LS (TB1) on the option board (positive lead) and the positive meter jack (negative meter lead).

For units with J3 set to "C&D CHARGERS": Close ac breaker and leave the dc breaker open. On the option board turn the potentiometer R13 fully counterclockwise. (R13 is a 25-turn potentiometer. Several turns may be necessary to go fully counter clockwise.) Once fully counter clockwise, turn R13 clockwise for 2 ½ turns.

Adjust potentiometer R14 on the option board for –5.0 volts on voltmeter. Close dc breaker and place rated load on charger. The voltmeter should read –4.5 volts. If necessary, adjust R13 by one-quarter turn then readjust R14 to obtain the required levels. Please note R13 and R14 adjustments interact.

For units with J3 set to "+":

CAUTION: For this calibration the user must know the desired output voltage for the load share connection of no load and at rated load. Without this information, the board cannot be calibrated. The calibration process requires loading the units to rated current and may be very time consuming. A factory-calibrated board should not be readjusted unless it is absolutely necessary.

For "positive" (+) load sharing (-10V at 0% load, -2.0V at 100% load), open the ac breaker. Turn the potentiometer R12 (gain) on the option board fully counterclockwise. Once fully counter clockwise, turn R12 clockwise 7½ turns. Adjust potentiometer R14 (zero) on the option board for –10.0V. Close dc breaker and load the HRT to its rated output current. Verify the voltage is –2.0V. If necessary, readjust R12 and R14 to obtain –10.0 volts at no load and –2.0 volts at rated load. Note that the R12 and R14 adjustments interact.

For "negative" (-) load sharing OV at 0% load, 8V at 100% load), open the ac breaker. Turn the potentiometer R12 (gain) on the option board fully counterclockwise. Once fully counterclockwise, turn R12 clockwise 9 turns. Adjust potentiometer R14 (zero) on the option board for 0.0 volts on the meter. Close the dc breaker and current. Verify the voltmeter reads 8 volts. If necessary, readjust R12 and 8 volts at rated load. Note that R12 and R14 adjustments interact.

5.6 OPTION BOARD (UTILITY)

The option board provides an equalize timer and alarm contacts on one circuit board. The option board is installed as indicated on the drawings listed below:

Model	Drawing
HRT24AC25U	MBC-5544
HRT24AC50U	MBC-5544
HRT24AC100U	MBC-5542
HRT48AC15U	MBC-5544
HRT48AC30U	MBC-5544
HRT48AC50U	MBC-5542
HRT48AC100U	MBC-5533

When installing or adjusting an option board be sure the internal wires do not rest against the option board. Refer to the appropriate installation drawing for more information.

5.7 ALARM CONTACTS (UTILITY)

The alarm contacts are accessible through the terminals on the right side of the circuit board. The terminals are spring-loaded. By pushing the orange tab to the left, the terminal will open to release or receive a tripped wire. The wire size range is 26-14 AWG. Normally, open and closed contacts are provided for no-charge alarm (TB2, NCA), negative lead ground faults (TB3-GND), positive lead ground faults (TB4+GND), low-voltage alarm (TB6, LVA), high-voltage alarm (TB7, HVA), and ac on (TB8, PWR). The operation is described I the following table:

Alarm	**Relay Operation**
AC PWR	De-energized by alarm conditions
HVA	Energized by alarm conditions
LVA	De-energized by alarm conditions
+GND	Energized by alarm conditions
-GND	Energized by alarm conditions
NCA	De-energized by alarm conditions

5.8 REMOTE CONTROL (UTILITY)

Remote control of the float or equalize mode is available through TB5, remote equalize. The contact should be rated for 1 mA, 5 volt operation. To use this feature, remove the jumper from TB5 and connect the remote control contacts to these terminals.

For remote control of the output mode, the local/remote selector switch must be in remote position. With the switch in this position, the output mode is controlled by the option board and contact status preset to TB5. A closed contact selects float mode for the rectifier and an open contact selects equalize mode. If the remote control contact is not used, a jumper must be placed between the TB5 terminals as originally provided. If the option board equalizer timer (described below) is selecting equalize mode, the remote contact status is ignored. To assure proper operation, a jumper or remote control contacts must be connected to TB5.

5.9 EQUALIZE TIMER (UTILITY)

The equalize timer function is activated by changing the local/remote selector switch form local to remote. This action initiates only one timer cycle. If the HRT is already set to remote, rock the switch from remote to local to remote.

When activated, the unit operates in equalize mode for the number of hours selected via S2 and S3, plus an additional six minutes. Operation of the remote control connected to the TB5 will not initiate a timer cycle.

The switches S3 and S2 select the desired number of hours for the equalize timer cycle. Setting the switches should only be done by qualified service personnel. Any period from 00 to 99 hours may be set. For periods less than 10 hours, S3 is set to zero an S2 is set to the desired number of hours.

External events can affect the equalize timer function, an ac poser failure will terminate the equalize timer cycle. Changing the local/remote switch from remote to local puts the rectifier in the mode selected via the float/equalize switch. Returning the switch to remote activates the timer as described above. If the TB% terminals (described above) are connected to open contacts or are otherwise not shorted together, the HRT will remain in equalize mode after the timer cycle is finished. For proper operation, a jumper or remote control contacts must be connected to TB5.

5.10 LIGHTING ARRESTERS

Optional lightning arrestors for the dc input are available for all HRT models.

Model:	Drawing
HRT24AC25E	MBC-5488
HRT24AC50E	MBC-5488
HRT48AC15E	MBC-5488
HRT48AC30E	MBC-5488
HRT24AC25U	MBC-5488
HRT24AC50U	MBC-5488
HRT48AC15U	MBC-5488
HRT48AC30U	MBC-5488
HRT24AC100E	KBC-5295
HRT48AC50U	KBC-5295
HRT24AC100U	KBC-5295
HRT48AC50U	KBC-5295
HRT24AC200E	KBC-5296
HRT48AC100E	KBC-5296
HRT48AC100U	KBC-5296

5.11 GROUND VOLTMETER SWITCH (UTILITY)

The ground voltmeter switch allows the internal analog voltmeter and/or an external voltmeter connected to the pin jacks to measure the potential from either output lead to ground. Normal readings are approximately six volts from ground to the negative output lead. The positive lead to ground will be approximately 40 volts and 20 volts for nominal 48 and 24-volt units, respectively. The dissymmetry in voltage measurements is due to the ground detection scheme for the ground lights. The ground voltmeter switch does not provide correct information to the digital meter but does provide correct voltages to the pin jacks.

5.12 ONE PERCENT METERS (UTILITY)

One percent analog voltmeters and ammeters are available on the utility models. The meters are identical in size and appearance to the standard meters but are more accurate.

CHAPTER SIX: REPLACEMENT PARTS LISTS

MODEL	RATED AC CURRENT①	RATED DC VOLTAGE②	INTERNAL CIRCUIT BREAKER RATINGS (AMPS)		CIRCUIT BREAKER INTERRUPTING RATING (AMPS)	
			AC⑤	DC	AC③	DC
HRT24AC25E	7.6/4.4/3.8	26.8	16/8/8	35	5000 @ 250 Vac	5000 @ 125 Vdc
HRT24AC50E	15/8.7/7.5	26.8	30/15/15	70	5000 @ 250 Vac	5000 @ 125 Vdc
HRT24AC100E	32/19/16	26.8	80/40/40 or 60/30/30④	125	5000 @ 250 Vac	10,000 @ 125 Vdc 25,000 @ 65 Vdc
HRT24AC200E	58/33/29	26.8	100/50/50	250	5000 @ 250 Vac	10,000 @ 125 Vdc 25,000 @ 65 Vdc
HRT48AC15E	8.6/5/4.3	52.6	20/10/10	20	5000 @ 250 Vac	5000 @ 125 Vdc
HRT48AC30E	18/10.3/9	52.6	40/20/20	40	5000 @ 250 Vac	5000 @ 125 Vdc
HRT48AC50E	28/16/14	52.6	60/30/30	70	5000 @ 250 Vac	5000 @ 125 Vdc
HRT48AC100E	58/33/29	52.6	100/50/50	125	5000 @ 250 Vac	10,000 @ 125 Vdc 25,000 @ 65 Vdc
HRT24AC25U	7.6/4.4/3.8	26.8	16/8/8	35	5000 @ 250 Vac	5000 @ 125 Vdc
HRT24AC50U	15/8.7/7.5	26.8	30/15/15	70	5000 @ 250 Vac	5000 @ 125 Vdc
HRT24AC100U	32/19/16	26.8	60/30/30	125	5000 @ 250 Vac	5000 @ 125 Vdc
HRT48AC15U	8.6/5/4.3	52.6	20/10/10	20	5000 @ 250 Vac	5000 @ 125 Vdc
HRT48AC30U	18/10.3/9	52.6	40/20/20	40	5000 @ 250 Vac	5000 @ 125 Vdc
HRT48AC50U	28/16/14	52.6	60/30/30	70	5000 @ 250 Vac	5000 @ 125 Vdc
HRT48AC100U	58/33/29	52.6	100/50/50	125	5000 @ 250 Vac	5000 @ 125 Vdc

①Rated currents are presented in the form 120V/208V/240V connected inputs.

②Rated voltage is calculated per NEMA PE7 – 1985. In practice, voltage should be adjusted to the battery manufacturer's recommendations. (NEMA PE7 = 2.15 X number of cells + 1 volt)

③Breaker fusing of four times rating is required. Otherwise the rating is 1000A @ 250 Vac.

④Early models shipped with either 80/40/40 or 60/30/30 breakers. Recommended replacement is 60/30/30.

⑤AC breaker ratings are 120V/208V/240V connected inputs. Poles are paralleled for 120V.

REPLACEMENT PARTS FOR HRT 24 AC 25E AND HRT 24 AC 25U

ITEM	SCHEMATIC LEGEND	C & D PART NUMBER	QUANTITY	DESCRIPTION
-	-	-	-	Cabinet outline
41	-	JN-38A	1	Name plate
-	AM	JM-242	1	Ammeter, 50A, 50mV, YEW
-	VM	JM-239	1	Voltmeter, 50V YEW
4	ACB	JR-751	1	AC circuit breaker, 2-pole, 8A, 250 Vac
5*	DCB	JR-755	1	DC circuit breaker, 1-pole, 35A, 125Vdc
-	DCB	JR-798	1	DC circuit breaker, 2-pole, 35A, 125Vdc
-	CBA	NBC-2155	1	Analog meter control board, telecommunications
-	CBA	NBC-2157	1	Analog meter control board, utility
-	CBA	NBC-2158	1	Digital meter control board, utility
19	RR	T-1900	1	Resonant reactor
-	TS1	JL-918	1	AC input terminal strip
-	TS2	JL-898	1	DC output terminal strip
55	GND	JH-1315	1	Ground lug
21	PFX	T-1898	1	Power transformer
11	C1	JC-135	1	Filter capacitor, 48,000 µF, 40 Vdc
11	C2	JC-186	1	Filter capacitor, 145,000 µF, 40 Vdc
18**	RA	JS-882	1	Triac/rectifier assembly
12	RC	JC-32	1	Resonant capacitor
23	R1, R2	JE-630	1	Resonant resistor, 1.5 ohm, 110W
19	FC	T-1902	1	Filter choke
-	AS	JM-248	1	Ammeter shunt, 50A, 50mV
**	TRIAC	JS-826	1	Triac, 35A, 600V
-	-	JS-883	1	Diode module, 30A, 400V
17	AXF	JT-276	1	Transformer, 36V C.T., 30VA
-	-	JA-2031-150V	1	Surge protector
-	HVSD	NBC-2341-24	1	Secondary high-voltage shutdown board

**Indicates recommended spare part. Item numbers refer to drawings in Chapter 7.

REPLACEMENT PARTS FOR HRT 24 AC 50E AND HRT 24 AC 50U

ITEM	SCHEMATIC LEGEND	C & D PART NUMBER	QUANTITY	DESCRIPTION
-	-	-	-	Cabinet outline
41	-	JN-38A	1	Name plate
-	AM	JM-243	1	Ammeter, 75A, 50mV, YEW
-	VM	JM-239	1	Voltmeter, 50V YEW
4	ACB	JR-753	1	AC circuit breaker, 2-pole, 15A, 250 Vac
5*	DCB	JR-709	1	DC circuit breaker, 1-pole, 70A, 125Vdc
-	DCB	JR-800	1	DC circuit breaker, 2-pole, 70A, 125Vdc
-	CBA	NBC-2155	1	Analog meter control board, telecommunications
-	CBA	NBC-2157	1	Analog meter control board, utility
-	CBA	NBC-2158	1	Digital meter control board, utility
19	RR	T-1901	1	Resonant reactor
-	TS1	JL-918	1	AC input terminal strip
-	TS2	JL-898	1	DC output terminal strip
55	GND	JH-1315	1	Ground lug
21	PFX	T-1897	1	Power transformer
11	C1	JC-186	2	Filter capacitor, 145,000 µF, 40 Vdc
11	C2	JC-186	1	Filter capacitor, 145,000 µF, 40 Vdc
10**	RA	JS-881	1	Triac/rectifier assembly
18	RC	JC-61	1	Resonant capacitor, 18 µF, 660 Vdc
12	R1, R2	JE-630	1	Resonant resistor, 1.5 ohm, 110W
19	FC	T-1903	1	Filter choke
-	AS	JM-249	1	Ammeter shunt, 75A, 50mV
**	TRIAC	JS-826	1	Triac, 35A, 600V
-	-	JS-878	1	Diode module, 60A, 400V
17	AXF	JT-276	1	Transformer, 36V C.T., 30VA
-	-	JA-2031-150V	1	Surge protector
-	HVSD	NBC-2341-24	1	Secondary high-voltage shutdown board

* "E" suffix models use a single-pole breaker. "U" suffix models use a double-pole breaker.
**Indicates recommended spare part. Item numbers refer to drawings in Chapter 7.

REPLACEMENT PARTS FOR HRT 48 AC 15E AND HRT 48 AC 15U

ITEM	SCHEMATIC LEGEND	C & D PART NUMBER	QUANTITY	DESCRIPTION
-	-	-	-	Cabinet outline
41	-	JN-38A	1	Name plate
-	AM	JM-241	1	Ammeter, 20A, 50mV, YEW
-	VM	JM-240	1	Voltmeter, 80V YEW
4	ACB	JR-752	1	AC circuit breaker, 2-pole, 10A, 250 Vac
5*	DCB	JR-754	1	DC circuit breaker, 1-pole, 20A, 125Vdc
5*	DCB	JR-797	1	DC circuit breaker, 2-pole, 20A, 125Vdc
-*	CBA	NBC-2155	1	Analog meter control board, telecommunications
-*	CBA	NBC-2157	1	Analog meter control board, utility
-	CBA	NBC-2158	1	Digital meter control board, utility
19	RR	T-1912	1	Resonant reactor
-	TS1	JL-918	1	AC input terminal strip
-	TS2	JL-898	1	DC output terminal strip
55	GND	JH-1315	1	Ground lug
21	PFX	T-1896	1	Power transformer
11	C1	JC-184	1	Filter capacitor, 64,000 µF, 75 Vdc
11	C2	JC-184	1	Filter capacitor, 64,000 µF, 75 Vdc
10	RA	JS-882	1	Triac/rectifier assembly
18**	RC	JC-32	1	Resonant capacitor, 12 µF, 660 Vdc
12	R1, R2	JE-630	1	Resonant resistor, 1.5 ohm, 110W
19	FC	T-1902	1	Filter choke
-	AS	JM-247	1	Ammeter shunt, 20A, 50mV
-**	TRIAC	JS-826	1	Triac, 35A, 600V
-	-	JS-883	1	Diode module, 30A, 400V
17	AXF	JT-276	1	Transformer, 36V C.T., 30VA
-	-	JA-2031-150V	1	Surge protector
-	HVSD	NBC-2341-24	1	Secondary high-voltage shutdown board

**Indicates recommended spare part. Item numbers refer to drawings in Chapter 7.

REPLACEMENT PARTS FOR HRT 48 AC 30E AND HRT 48 AC 30U

ITEM	SCHEMATIC LEGEND	C & D PART NUMBER	QUANTITY	DESCRIPTION
-	-	-	-	Cabinet outline
41	-	JN-38A	1	Name plate
-	AM	JM-242	1	Ammeter, 50A, 50mV, YEW
-	VM	JM-240	1	Voltmeter, 80V YEW
4	ACB	JR-749	1	AC circuit breaker, 2-pole, 20A, 250 Vac
5*	DCB	JR-750	1	DC circuit breaker, 1-pole, 40A, 125Vdc
5*	DCB	JR-799	1	DC circuit breaker, 2-pole, 40A, 125Vdc
-	CBA	NBC-2155	1	Analog meter control board, telecommunications
-	CBA	NBC-2157	1	Analog meter control board, utility
-	CBA	NBC-2158	1	Digital meter control board, utility
19	RR	T-1899	1	Resonant reactor
-	TS1	JL-918	1	AC input terminal strip
-	TS2	JL-898	1	DC output terminal strip
55	GND	JH-1315	1	Ground lug
21	PFX	T-1895	1	Power transformer
11	C1	JC-184	2	Filter capacitor, 64,000 µFD, 75 Vdc
11	C2	JC-184	1	Filter capacitor, 64,000 µFD, 75 Vdc
10**	RA	JS-882	1	Triac/rectifier assembly
18	RC	JC-118	1	Resonant capacitor, 25 µFD, 660 Vdc
12	R1, R2	JE-637	2	Resonant resistor, 2.25 ohm, 155W
19	FC	T-1902	1	Filter choke
-	AS	JM-248	1	Ammeter shunt, 50A, 50Mv
-**	TRIAC	JS-826	1	Triac, 35A, 600V
-	-	JS-883	1	Diode module, 30A, 400V
17	AXF	JT-276	1	Transformer, 36V C.T., 30VA
-	-	JA-2031-150V	1	Surge protector
-	HVSD	NBC-2341-24	1	Secondary high-voltage shutdown board

* "E" suffix models use a single-pole breaker. "U" suffix models use a double-pole breaker.
**Indicates recommended spare part. Item numbers refer to drawings in Chapter 7.

REPLACEMENT PARTS FOR HRT 48 AC 50E AND HRT 48 AC 50U

ITEM	SCHEMATIC LEGEND	C & D PART NUMBER	QUANTITY	DESCRIPTION
-	-	-	-	Cabinet outline NBC-2140 Sheet 1
41	-	JN-38A	1	Name plate
-	AM	JM-243	1	Ammeter
-	VM	JM-240	1	Voltmeter
71	ACB	JR-721	1	AC circuit breaker, 2-pole, 30A
70*	DCB	JR-709	1	DC circuit breaker, 1-pole, 70A
-	DCB	JR-800	1	DC circuit breaker, 2-pole, 70A
-	CBA	NBC-2155	1	Analog meter control board, telecommunications
-	CBA	NBC-2157	1	Analog meter control board, utility
-	CBA	NBC-2158	1	Digital meter control board, utility
17	RR	T-1870	1	Resonant reactor
27	TS1	JL-918	1	AC input terminal strip
33	TS2	JL-898	1	DC output terminal strip
-	GND	JH-1278	1	Ground lug
15	PFX	T-1850	1	Power transformer
14	C1	JC-184	5	Filter capacitor, 64,000 µF, 75 Vdc
18**	RA	JC-852	1	Rectifier Assembly
19	RC	JS-117	1	Resonant capacitor
20	RC	JC-32	1	Resonant capacitor
23	R1, R2	JE-51	2	Resonant resistor
16	FC	T-1870	1	Filter choke
-	AS	JM-249	1	Ammeter shunt
31**	TRIAC	JS-826	1	Triac
18A	-	JS-548	2	Diode
17	AXF	JT-276	1	Transformer, 36V C.T., 30VA
18B	-	JA-2031-150V	1	Surge protector
-	-	NBC-2341-24	1	Secondary high-voltage shutdown board

**Indicates recommended spare part. Item numbers refer to drawings in Chapter 7.

REPLACEMENT PARTS FOR HRT 24 AC 100E AND HRT 24 AC 100U

ITEM	SCHEMATIC LEGEND	C & D PART NUMBER	QUANTITY	DESCRIPTION
-	-	-	-	Cabinet outline, NBC-2140 Sheet 1
41	-	JN-38A	1	Name plate
-	AM	JM-244	1	Ammeter
-	VM	JM-239	1	Voltmeter
71	ACB	JR-721	1	AC circuit breaker, 2-pole, 30A
70*	DCB	JR-706	1	DC circuit breaker, 1-pole, 125A
-	DCB	JR-801	1	DC circuit breaker, 2-pole, 125A
-	CBA	NBC-2155	1	Analog meter control board, telecommunications
-	CBA	NBC-2157	1	Analog meter control board, utility
-	CBA	NBC-2158	1	Digital meter control board, utility
17	RR	T-1842	1	Resonant reactor
27	TS1	JL-918	1	AC input terminal strip
33	TS2	JL-898	1	DC output terminal strip
51	GND	JH-1315	1	Ground lug
15	PFX	T-1841	1	Power transformer
14	C1	JC-135	4	Filter capacitor, 48,000 µF, 40 Vdc
14	C2	JC-186	1	Filter capacitor, 145,000 µF, 40 Vdc
18**	RA	JS-852	1	Rectifier Assembly
19	RC	JC-117	1	Resonant capacitor, 30 µF, 660 Vdc
20	RC	JC-32	1	Resonant capacitor, 12 µF, 660 Vdc
23	R1, R2	JE-51	2	Resonant resistor, 1.5 ohm, 225W
16	FC	T-1845	1	Filter choke
-	AS	JM-250	1	Ammeter shunt, 150A, 50mV
31**	TRIAC	JS-826	1	Triac, 35A, 600V
18A	-	JS-548	2	Diode 125A, 300V
26	AXF	JT-276	1	Transformer, 36V C.T., 30VA
18B	-	JA-2031-150V	1	Surge protector
-	HVSD	NBC-2341-24	1	Secondary high-voltage shutdown board

* "E" suffix models use a single-pole breaker. "U" suffix models use a double-pole breaker.
**Indicates recommended spare part. Item numbers refer to drawings in Chapter 7.

REPLACEMENT PARTS FOR HRT 24 AC 200E

ITEM	SCHEMATIC LEGEND	C & D PART NUMBER	QUANTITY	DESCRIPTION
-	-	-	-	Cabinet outline NBC-2258 Sheet 1
41	-	JN-38A	1	Name plate
-	AM	JM-245	1	Ammeter
-	VM	JM-239	1	Voltmeter
-	ACB	JR-556	1	AC circuit breaker, 2-pole, 50A
-	DCB	JR-707	1	DC circuit breaker, 1-pole, 250A
-*	CBA	NBC-2155	1	Analog meter control board, telecommunications
10	RR	T-1893	1	Resonant reactor
-	TS1	JL-704	1	AC input terminal strip
-	TS2	JL-607	1	DC output terminal strip
-	GND	JH-1315	1	Ground lug
2	PFX	T-1894	1	Power transformer
6	C1	JC-135	10	Filter capacitor, 48,000 µF, 40 Vdc
6	C2	JC-186	2	Filter capacitor, 145,000 µF, 40 Vdc
4*	RA	JS-869	1	Rectifier Assembly
-	RC	JC-117	2	Resonant capacitor, 30 µF, 600 V
8	R1, R2	JE-51	2	Resonant resistor
3	FC	T-1892	1	Filter choke
-	AS	JM-251	1	Ammeter shunt
-*	TRIAC	JS-826	1	Triac
4A	-	JS-654	2	Diode module, 300A, 300V
26	AXF	JT-276	1	Transformer, 36V C.T., 30VA
4B	-	JA-2031-150V	1	Surge protector
-	HVSD	NBC-2341-24	1	Secondary high-voltage shutdown board

**Indicates recommended spare part. Item numbers refer to drawings in Chapter 7.

REPLACEMENT PARTS FOR HRT 48 AC 100E AND HRT 48 AC 100U

ITEM	SCHEMATIC LEGEND	C & D PART NUMBER	QUANTITY	DESCRIPTION
-	-	-	-	Cabinet outline, NBC-3000 Sheet 1
41	-	JN-38A	1	Name plate
-	AM	JM-244	1	Ammeter
-	VM	JM-240	1	Voltmeter
-	ACB	JR-556	1	AC circuit breaker, 2-pole, 50A
-*	DCB	JR-706	1	DC circuit breaker, 1-pole, 125A
-*	DCB	JR-801	1	DC circuit breaker, 2-pole
-	CBA	NBC-2155	1	Analog meter control board, telecommunications
-	CBA	NBC-2157	1	Analog meter control board, utility
-	CBA	NBC-2158	1	Digital meter control board, utility
-	RR	T-1817	1	Resonant reactor
-	TS1	JL-704	1	AC input terminal strip
-	TS2	JL-898	1	DC output terminal strip
-	GND	JH-1278	1	Ground lug
2	PFX	T-1816	1	Power transformer
-	C1, C2	JC-184	8	Capacitors
4**	RA	JS-828	1	Rectifier Assembly
-**	RC	RT-87	1	Resonant capacitor, 2 µF, 660 Vdc
-**	RC	JC-118	1	Resonant capacitor, 25 µF, 660 Vdc
-**	RC	JC-117	1	Resonant resistor, 30 µF, 660 Vdc
8	R1, R2	JE-51	2	Resonant resistor
3	FC	T-1818	1	Filter choke
23	AS	JM-250	1	Ammeter shunt
-**	TRIAC	JS-826	1	Triac
18A	-	JS-548	2	Diode 125A, 300Vdc
-	AXF	JT-276	1	Transformer, 36V C.T., 30VA
18B	-	JA-2031-150V	1	Surge protector
-	HVSD	NBC-2341-24	1	Secondary high-voltage shutdown board

* "E" suffix models use a single-pole breaker. "U" suffix models use a double-pole breaker.
**Indicates recommended spare part. Item numbers refer to drawings in Chapter 7.

CHAPTER SEVEN: DRAWINGS

NBC-2418
NBC-2413
NBC-2420
NBC-2419
NBC-2470
NBC-2465
MBC-5524
MBC-5490
NBC-2417
NBC-2416
NBC-2324
NBC-2327
NBC-2414
NBC-2406
NBC-2379
NBC-2380
NBC-2415
NBC-2381
NBC-2325
NBC-2391
NBC-2378
NBC-2326
MBC-5488
KBC-5295
KBC-5296
MBC-5466
MBC-5542
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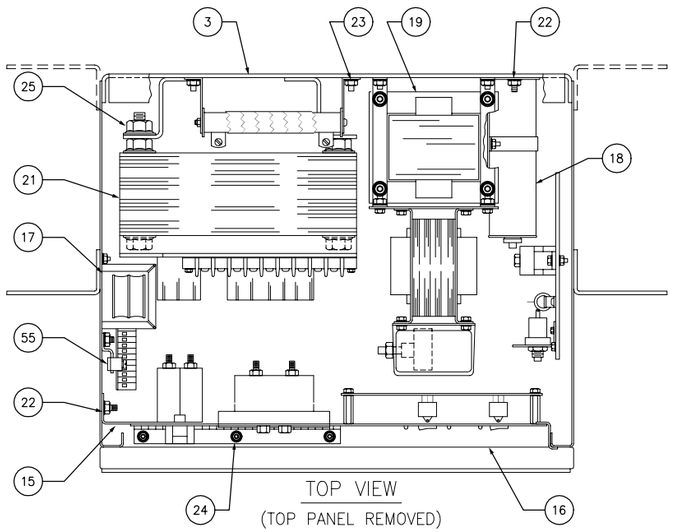
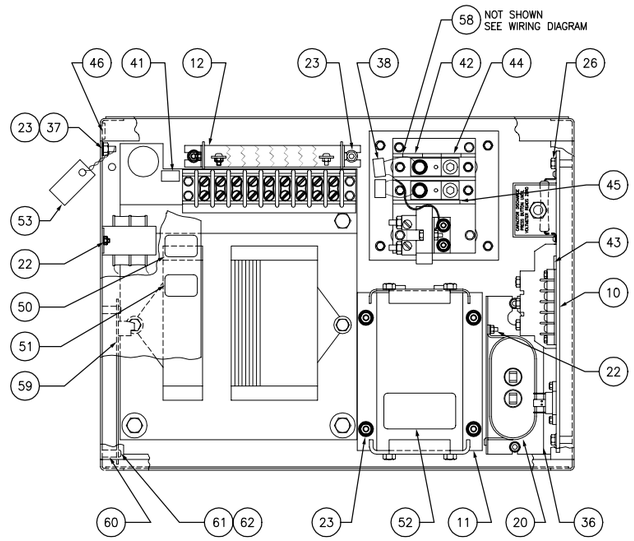
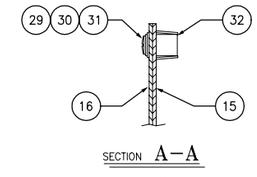
MBC-5543
MBC-5333
MBC-5545
NBC-2486
NBC-2486SD
NBC-2169
NBC-2170



TOP VIEW
(TOP PANEL REMOVED)

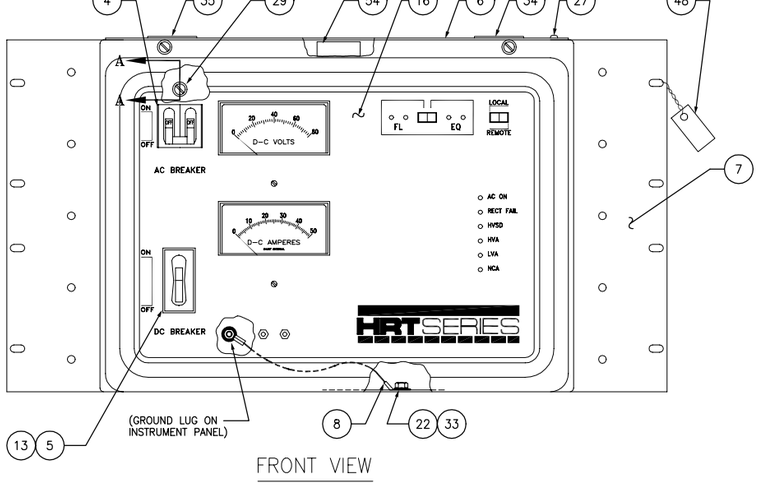


FRONT VIEW
(FRONT DOOR & INSTRUMENT PANEL REMOVED)

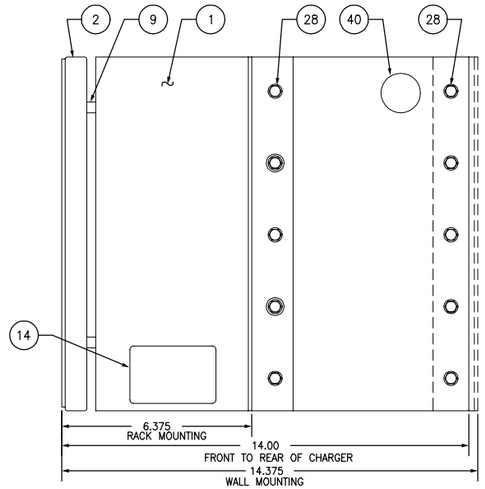


SECTION A–A
SCALE 1:1

NOTES:
1. ITEM 47 TIED TO ITEM 16.
2. ITEM 49 TIED TO THE WIRING OF ITEM 4.



FRONT VIEW



RIGHT SIDE VIEW

ITEM	DESCRIPTION
62	SCREW
61	WASHER
60	STANDOFF
59	CIRCUIT BOARD
58	MOV ASSEMBLY
57	MOV ASSEMBLY
56	MOV ASSEMBLY
55	GROUND LUG
54	LABEL, GROUND
53	TAG, GROUND ONLY
52	LABEL ,CAUTION
51	LABEL, EMERGENCY SERVICE
50	LABEL, HIGH VOLTAGE
49	VOLTAGE CARD
48	TAG, INSTRUCTION & INSTALLATION
47	TAG, VOLTAGE SETTING
46	LABEL (GRD)
45	LABEL (NEG)
44	LABEL (POS)
43	LABEL (TB3)
42	LABEL (TB2)
41	LABEL (TB1)
40	HOLE PLUG
39	HARNESS
38	CAPACITOR ASSEMBLY
37	WASHER

ITEM	DESCRIPTION
36	BRACKET
35	SNAP BUSHING
34	CAP PLUG
33	WASHER
32	RECEPTACLE
31	WASHER, CUP AND RETAINER
30	SPRING
29	FASTENER
28	SCREW
27	SCREW
26	SCREW
25	NUT
24	NUT
23	NUT
22	NUT
21	TRANSFORMER, POWER
20	CLAMP
19	REACTOR/CHOKE ASSEMBLY
18	CAPACITOR
17	TRANSFORMER, CONTROL
16	PANEL, INSTRUMENT
15	BRACKET, BREAKER
14	NAMEPLATE
13	SCREW
12	RESISTOR
11	CAPACITOR ASSEMBLY
10	HEATSINK ASSEMBLY
9	BUMPER, SNAP–IN
8	GROUND WIRE ASSEMBLY
7	ANGLE, RACK/WALL MOUNTING
6	PANEL, TOP
5	DC BREAKER
4	AC BREAKER
3	BACK PANEL
2	FRONT DOOR ASSEMBLY
1	CABINET, WELDMENT

ISSUES

ISSUE #	DESCRIPTION	ISS. BY ISS. DATE	APP. BY APP. DATE
1	SEE ECN 10059 (ADOBE PROCESSED 4/4/02; OLD FILE NAME=Nbc2418)	KEL	MCM 03/24/94

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES ± TOLERANCES ON:		APPROVALS	DATE
HOLES	+0. 004 −0. 002	DRAWN G. D. HAWKINS	06/10/91
FRACTIONS	±1/32	CHECKED D. B. WILSON	08/20/91
DECIMALS (XX)	±0. 020	APPROVED D. H. MUHLRAD	08/20/91
DECIMALS (XXX)	±0. 010	APPROVED	
ANGLES	±1/2°		

SQUARE CORNERS AND ANGLES ARE 90° UNLESS OTHERWISE SPECIFIED.

MATERIAL:

FINISH:

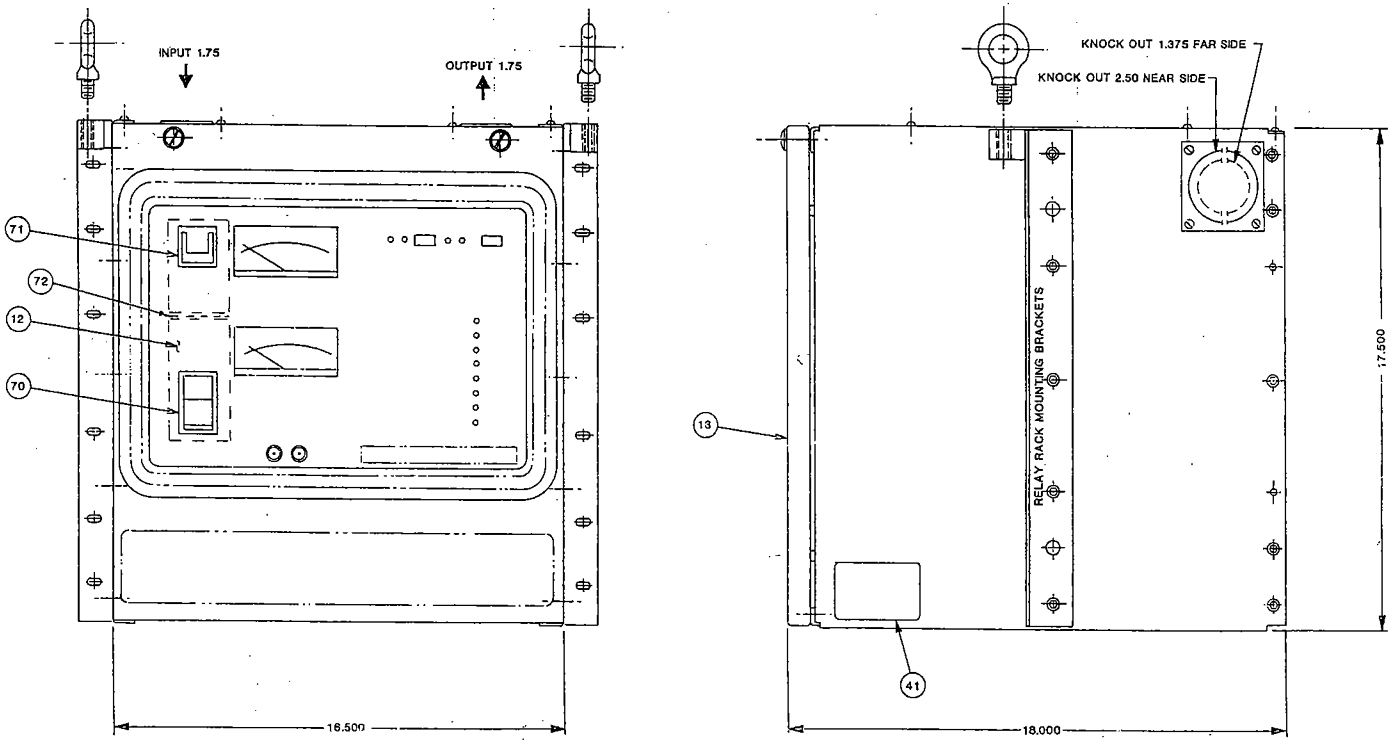
C&D TECHNOLOGIES
Power Solutions

GENERAL ARRANGEMENT HRT CABINET 12-1/4H

SIZE	DOC TYPE / NUMBER	ISSUE
B	NBC–2418	1

SCALE:	SHEET:	FILE NAME:
N/A	1 OF 1	NBC2418.SHT1.ISS1

ZONE	REV	DESCRIPTION	DATE	APPROVED
	1	SEE ECN 9413	12-4-91	[illegible]
	2	SEE ECN 9915	12/13/93	[illegible]
	3	SEE ECN 10352 KGL	2/20/95	[illegible]



CABINET FEATURES

REMOVABLE FRONT PANEL	FOR ACCESS TO INSTRUMENT PANEL TO MAKE MINOR ADJUSTMENTS AND TESTING.
REMOVABLE TOP & BACK PANELS	FOR ACCESS TO CABINET FOR PREVENTATIVE MAINTENANCE AND SERVICEABLY.
REMOVABLE CAPACITOR TRAY ASSY.	FOR PERIODIC REPLACEMENT OF CANISTERS.

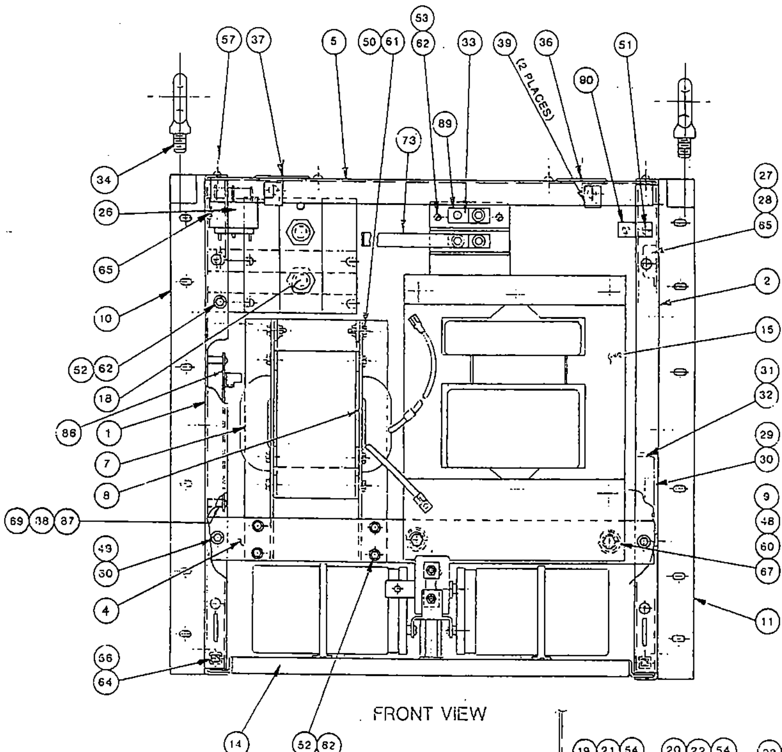
NOTES:

1. RELAY RACK MOUNTING BRACKETS AND LIFTING EYE MAY VARY FROM THIS ILLUSTRATION, SEE WORK SHEET FOR PART NUMBER.
2. THE APPEARANCE OF ITEM 70 MAY VARY FROM THIS ILLUSTRATION.

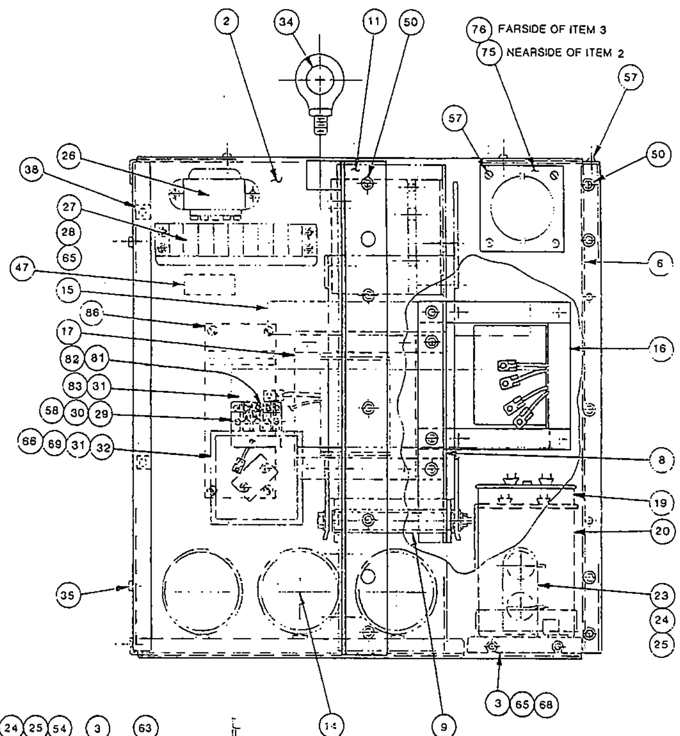
ISSUE	DATE	QTY
CONSHOHOCKEN	2-23-91	4
DUNLAP	2-23-91	4
[illegible]	[illegible]	[illegible]

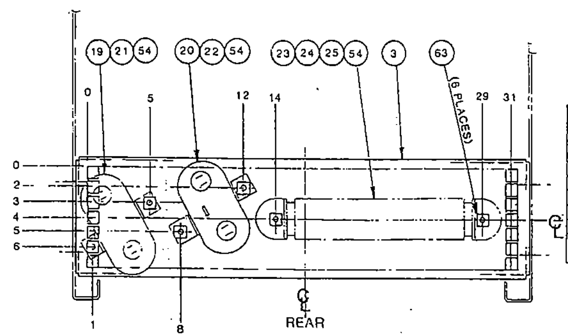
DRAWN R.B.WEBER	DATE 5-23-91	C&D TECHNOLOGIES, INC. Power Solutions
CHECKED D.B. W.	5-30-91	GENERAL ARRANGEMENT HRT SERIES 17-1/2 INCH CABINET.
APPROVED [illegible]	7/23/91	NBC-2413
MATERIAL:		SCALE 1/2 REV. SHEET 1 OF 2

ZONE	REV	DESCRIPTION	DATE	APPROVED
	1	SEE ECN 9314	12-4-91	
		SEE ECN 9975		
	3	SEE ECN 10352	2/28/95	



FRONT VIEW





REAR

NOTES:

1. ITEM 40 TIED TO WIRING NEAR ITEM 27.
2. ITEM 42 TIED TO ITEM 12.
3. ITEM 43 TIED TO ITEM 5 ON OUTSIDE.
4. INSTALL ITEMS 84, 85, AND 89 AS SHOWN ON WIRING DIAGRAM.
5. LOCATE ITEM 73 ON ITEM 33 AS SHOWN ON THE WIRING DIAGRAM
6. SEQ. 23, 24, 25 MAY BE IN AN ASSEMBLY.

ITEM	DESCRIPTION
90	LUG
89	MOV ASSEMBLY
88	SCREW
87	SPACER
86	HVSD BOARD
85	MOV ASSEMBLY
84	MOV ASSEMBLY
83	SNUBBER CAPACITOR
82	SNUBBER RESISTOR
81	VINYL SLEEVE
80	LABEL (TB2)
79	LABEL (TB1)
78	LABEL (POS)
77	LABEL (NEG)
76	COVERPLATE
75	COVERPLATE
74	HARNESS, CONTROL AND POWER
73	BUSBAR (NOT IN ALL UNITS)
72	INSULATOR (NOT IN ALL UNITS)
71	AC BREAKER
70	DC BREAKER
69	WASHER
68	WASHER, FLAT
67	WASHER, FLAT
66	NUT
65	NUT
64	NUT
63	NUT
62	NUT
61	NUT
60	NUT
59	SCREW
58	SCREW
57	SCREW
56	SCREW
55	SCREW
54	SCREW
53	SCREW
52	SCREW
51	SCREW
50	SCREW
49	SCREW
48	BOLT
47	LABEL CAUTION
46	LABEL EMERGENCY SERVICE
45	LABEL HIGH VOLTAGE
44	TAG GRD ONLY
43	TAG INSTRUCTION & INSTALLATION
42	TAG VOLTAGE SETTING
41	NAME PLATE DATA
40	VOLTAGE CARDS
39	RECEPTACLE 1/4 TURN FTNR
38	NUT, TINNERMAN
37	CAPLUG 1.75
36	SNAP BUSHING 1.75
35	BUMPER SNAP-IN
34	EYE BOLT
33	TERMINAL BLOCK
32	HEAT SINK
31	TRIAC
30	TERMINAL STRIP
29	BARRIER STRIP
28	MARKER STRIP
27	TERMINAL STRIP
26	XFMR CONTROL
25	BOLT, MICA/CTRG WASHER
24	RESISTOR BRACKET MTG.
23	RESISTOR
22	BRACKET
21	BRACKET
20	CAPACITOR
19	CAPACITOR
18	RECTIFIER ASSY.
17	RESONANT REACTOR ASSY.
16	CHOKE ASSY.
15	XFMR
14	CAPACITOR TRAY ASSY.
13	REMOVABLE FRONT DOOR ASSY.
12	INSTR PANEL ASSY
11	MOUNTING ANGLE RH
10	MOUNTING ANGLE LH
9	TRANSFORMER LOCKING TUBE
8	ANGLE SUPPORT RH
7	ANGLE SUPPORT LH
6	BACK PANEL
5	TOP PANEL
4	SWAY BAR
3	PERFORATED TRAY
2	SIDE PANEL RH
1	SIDE PANEL LH

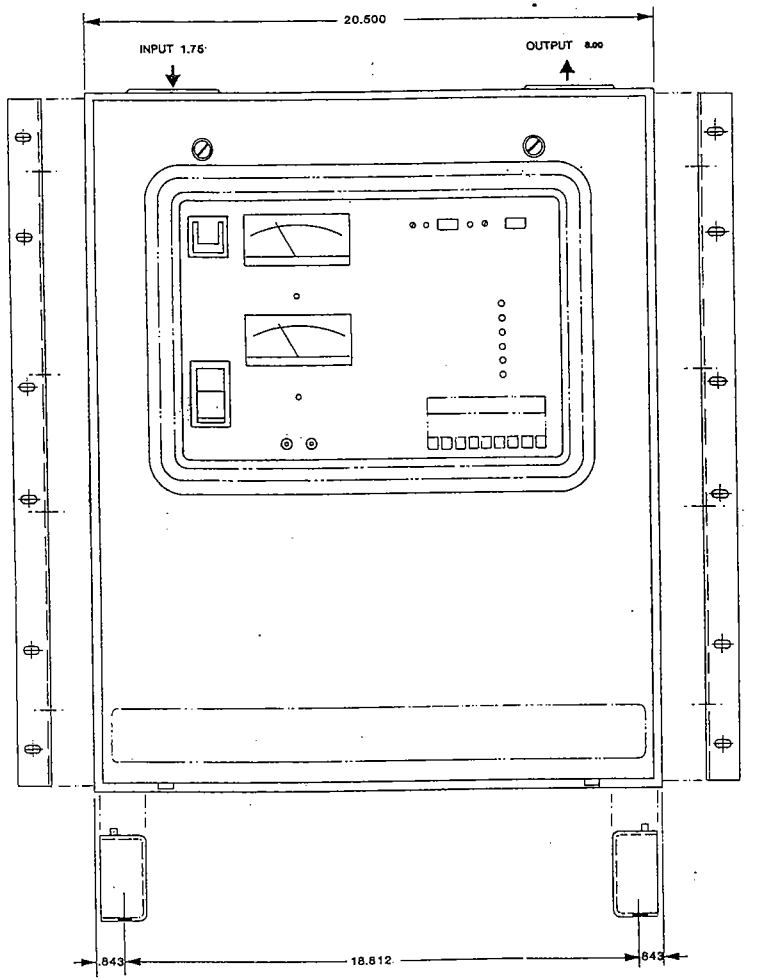
DRAWN	R.R. WEBER 5-23-91
CHECKED	5-30-91
APPROVED	7/25/91
MATERIAL:	

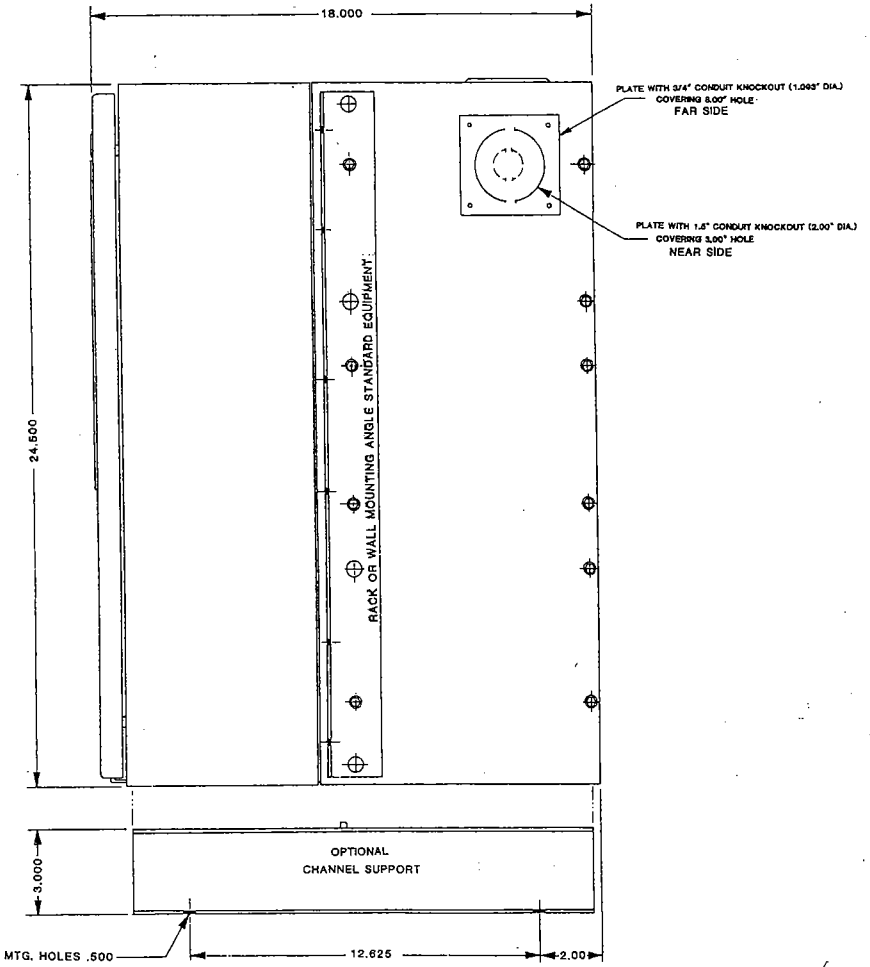
C&D TECHNOLOGIES, INC.
Power Solutions

GENERAL ARRANGEMENT
HRT SERIES 17-1/2 INCH CABINET

SIZE	DWG. NO.	REV.	SHEET
D	NBC-2413	8	2 OF 2

OBSOLETE - FOR RECORD ONLY





CABINET FEATURES

REMOVABLE FRONT PANEL — FOR ACCESS TO CONTROL PANEL TO MAKE MINOR ADJUSTMENTS AND TESTING.

REMOVABLE FRONT HALF — FOR PREVENTATIVE MAINTENANCE AND SERVICEABILITY

OPTIONAL CHANNEL SUPPORTS FOR TABLE OR RACK MOUNTING

Final Copy W BH 7/2/95

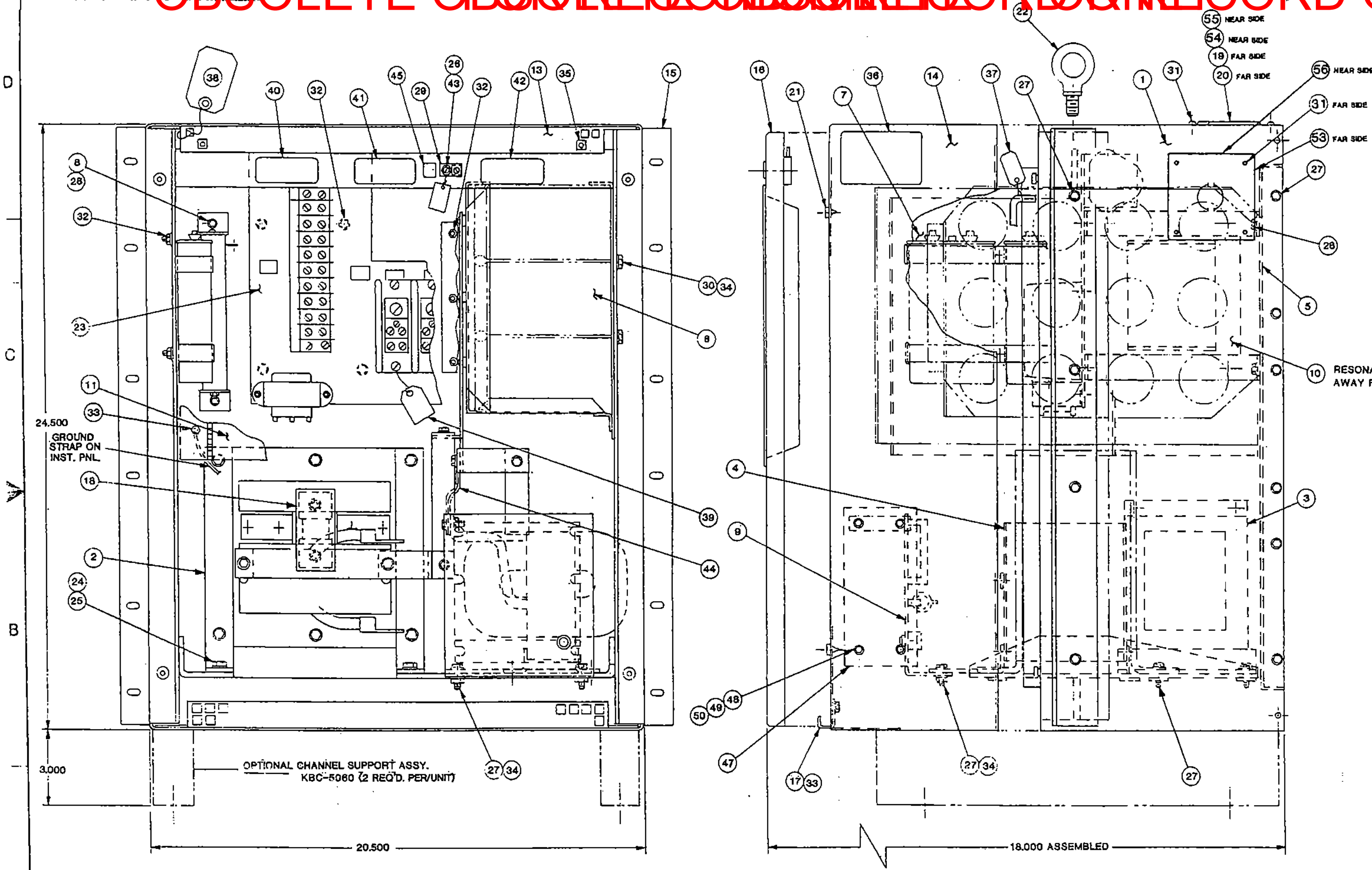
CD TECHNOLOGIES, INC. Power Solutions

GENERAL ARRANGEMENT
HRT24AC200E

NBC-2420

SCALE 1/2 REV. NO. 0 SHEET 1 OF 2

OBSOLETE - FOR RECORD ONLY



56	COVER PLATE
55	BUSHING, SNAP-IN (TIED TO UNIT)
54	CAP LUG
53	COVER PLATE
52	MOV ASSEMBLY
51	MOV ASSEMBLY
50	LOCKWASHER
49	SCREW
48	STANDOFF
47	CIRCUIT BOARD

RESONANT REACTOR LEADS ARE TO BE DRESSED AWAY FROM THE RESONANT RESISTOR ITEM 8.

ITEM	DESCRIPTION
46	MOV ASSEMBLY
45	DECAL, GROUND
44	BUSBAR (BRAIDED)
43	TAG, WIRE FOR GRD ONLY
42	LABEL, EMER. SERVICE
41	NAMEPLATE, CAUTION
40	DECAL, HIGH VOLTAGE
39	VOLTAGE CARDS
38	TAG, INST. SERVICE INSTALLATION
37	TAG, VOLTAGE SETTING
36	NAMEPLATE
35	NUT, SELF RETAINING
34	NUT
33	NUT
32	NUT
31	SCREW
30	SCREW
29	LUG
28	SCREW
27	SCREW
26	SCREW
25	WASHER
24	SCREW
23	TERMINAL PANEL
22	EYEBOLT
21	BUMPER, SNAP-IN
20	CAPLUG
19	BUSHING, SNAP-IN (TIED TO UNIT)
18	SHUNT
17	RETAINING CLIP
16	FRONT DOOR
15	RACK MTG. ANGLE
14	FRONT HALF CAB. WELDMENT
13	TOP PANEL
12	HARNESS ASSY.
11	INSTRUMENT PANEL
10	REACTOR
9	ACCESSORY PANEL
8	RESISTOR ASSY.
7	RESONANT CAP. ASSY.
6	FILTER ASSY.
5	BACK PANEL ASSY.
4	RECTIFIER ASSY.
3	CHOKE
2	TRANSFORMER
1	BACK HALF CAB. WELDMENT

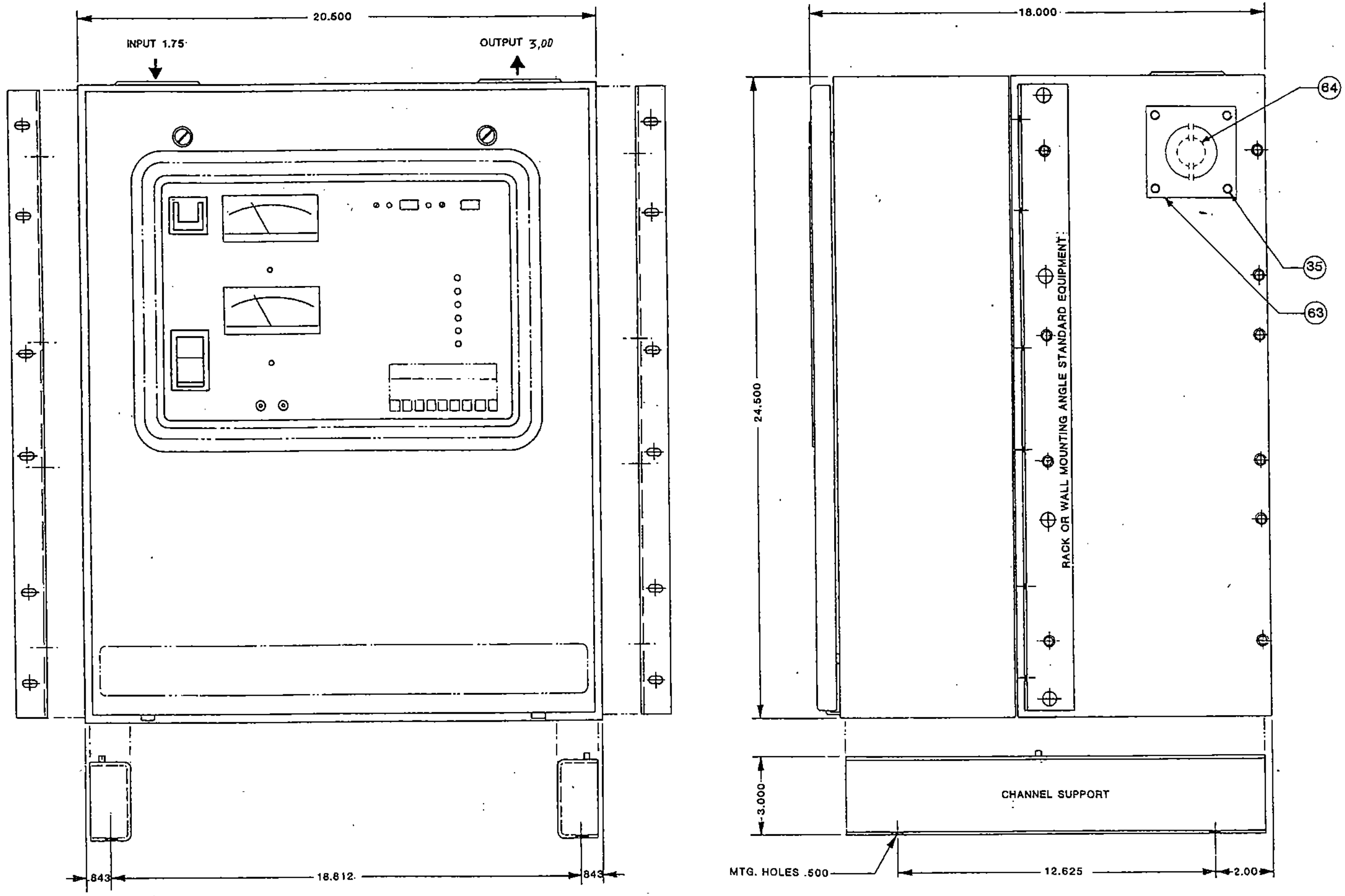
NOTE: SEE WIRING DIAGRAM FOR INSTALLATION OF ITEMS 46, 51, AND 52.

ISSUE	DATE	QTY
CONSHOHOCKEN	11-2	✓
DUNLAP		✓
PURCHASING		

SIZE D | CODE IDENT. NO. | NBC-2420

SCALE 1/2 | REV. LEVEL / | SHEET 2 OF 2

OBSOLETE - FOR RECORD ONLY



CABINET FEATURES

REMOVABLE FRONT PANEL	FOR ACCESS TO CONTROL PANEL TO MAKE MINOR ADJUSTMENTS AND TESTING.
REMOVABLE FRONT HALF	FOR PREVENTATIVE MAINTENANCE AND SERVICEABLY.

ISSUE	DATE	QTY
CONSTRUCTION	11-7-91	4
DUNLAP	11-7-91	4
PURCHASING	11-7-91	2

DRAWN	R.S.WEBER	7-9-91
CHECKED	D.A.V.	11-1-91
APPROVED	M.R.G.	8/10/94

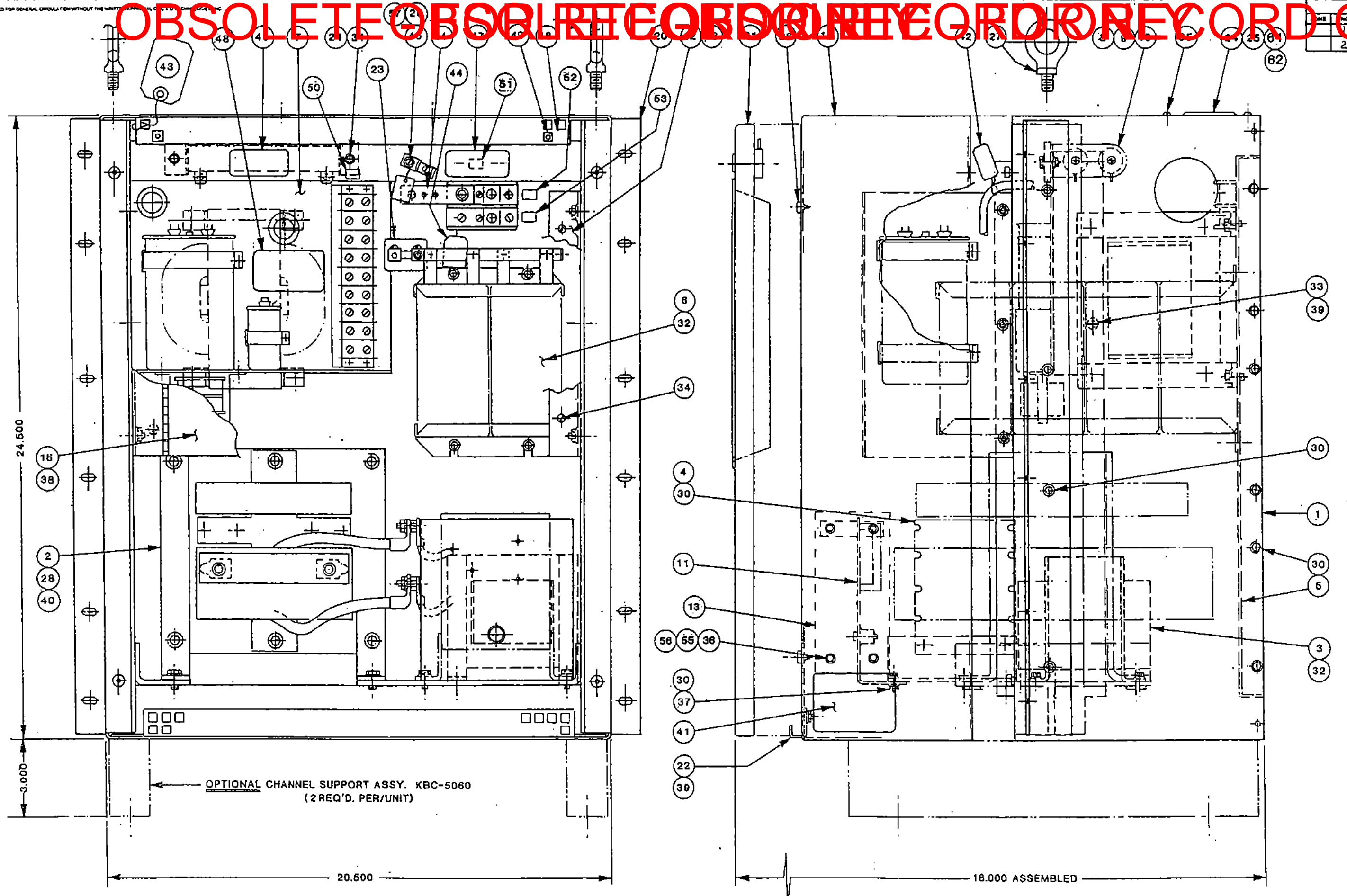
C&D TECHNOLOGIES, INC.
Power Solutions

GENERAL ARRANGEMENT
HRT48AC100E, POS GND

SIZE D | NBC-2419
SCALE 1/2 | REV. NO. 2 | SHEET 1 OF 2

OBSOLETE – FOR RECORD ONLY

ZONE	NO.	DESCRIPTION	DATE	APPROVED
	1	SEE ECN 9917	12/13/93	GMM
	2	SEE ECN 10533	10/16/95	MCM



ITEM	DESCRIPTION
64	COVER PLATE
63	COVER PLATE
62	BUSHING, SNAP-IN
61	PLUG
59	MOV ASSEMBLY
58	MOV ASSEMBLY
57	LUG
56	LOCKWASHER
55	STANDOFF
54	MOV ASSEMBLY
53	DECAL NEG
52	DECAL POS
51	DECAL TB2
50	DECAL TB1
49	NUT, SELF RETAINER
48	LABEL-CAUTION
47	LABEL-EMER SERVICE
46	LABEL-HIGH VOLTAGE
45	TAG-GRD ONLY
44	TAG-VOLTAGE CONNECTED FOR
43	TAG-INSTRUCTION & INSTALLATION
42	TAG-VOLTAGE SETTING
41	NAME PLATE
40	WASHER
39	NUT
38	NUT
37	NUT
36	SCREW
35	SCREW
34	SCREW
33	SCREW
32	SCREW
31	SCREW
30	SCREW
29	SCREW
28	SCREW
27	EYE BOLT
26	BUMPER SNAP-IN
25	CAPLUG
24	BUSHING, SNAP IN
23	SHUNT
22	FRONT PNL RETAINING CLIP
21	REMOVABLE FRONT DOOR
20	RACK MTG ANGLE
19	FRONT HALF CAB WELDMENT
18	PERFORATED TOP
17	HARNESS ASSEM
16	INSTRUMENT PANEL
14	BUSBAR, TERMINAL BLOCK
13	CIRCUIT BOARD
12	SIDE RAIL RH
11	ACCESSORY PANEL
10	BOLT, MICA/CTRG WASHERS
9	RESISTOR BRACKET MTG.
8	RESISTOR
7	RESN CAP ASSY
6	FILTER ASSY
5	BACK PANEL ASSY.
4	RECTIFIER ASSY
3	CHOKE
2	TRANSFORMER
1	BACK HALF CAB WELDMENT

NOTE: SEE WIRING DIAGRAM FOR ITEM 54, 58 AND 59.

SEQ. 8, 9, 10 MAY BE IN AN ASSEMBLY.

ISSUE	DATE	QTY
QUESTION/CHICKEY	11-7-91	4
DUNLAP	11-7-91	4
YOUCHUNG	11-7-91	7

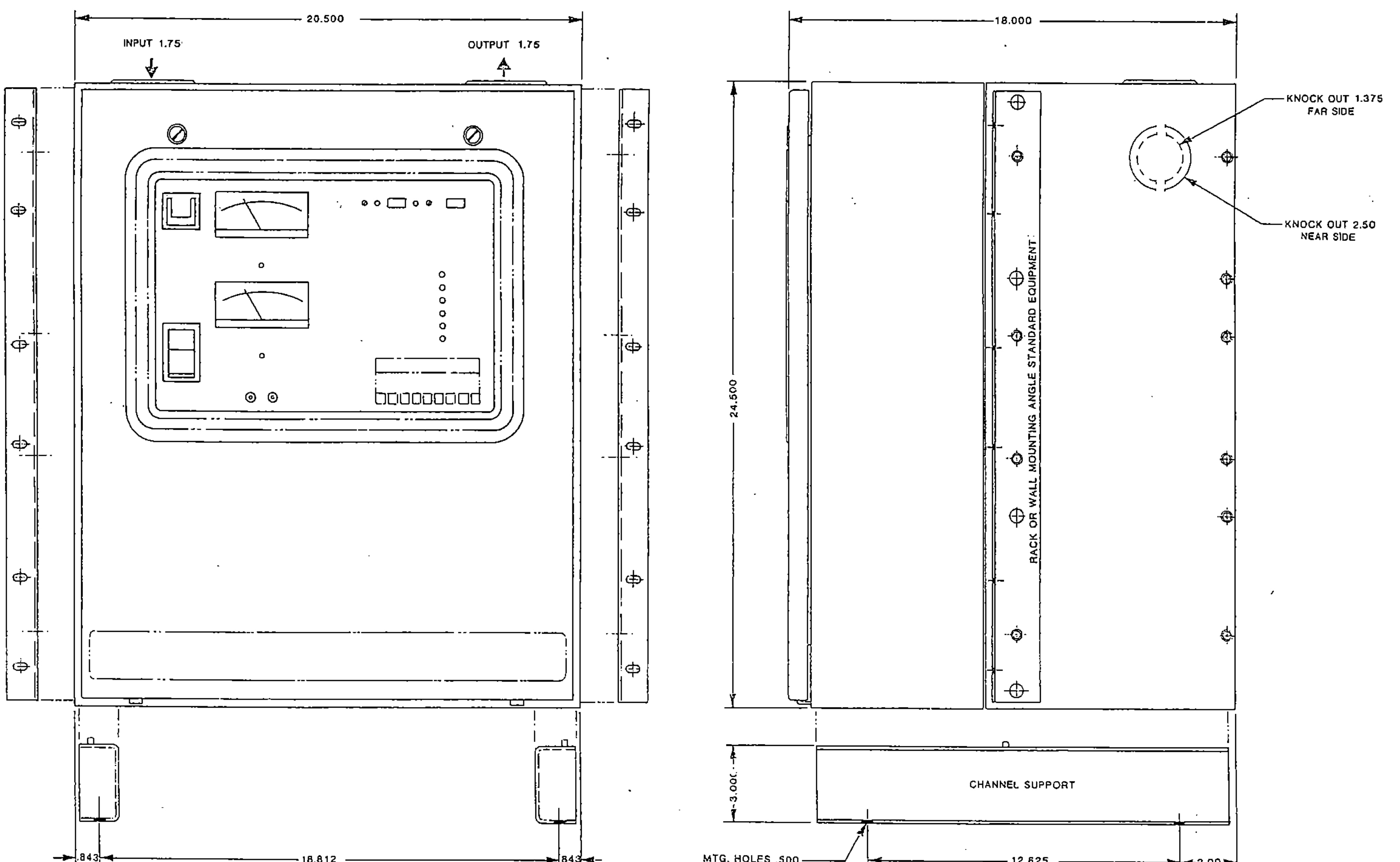
DRAWN	R.B.WEBER	7-9-91
CHECKED	[illegible]	11-4-91
APPROVED	D.H. [illegible]	11-7-91

C&D TECHNOLOGIES, INC.
Power Solutions

GENERAL ARRANGEMENT
FRT48AC100E, POS GND

SIZE D | NBC-2419

SCALE 1/2 | REV. 2 | SHEET 2 OF 2



CABINET FEATURES

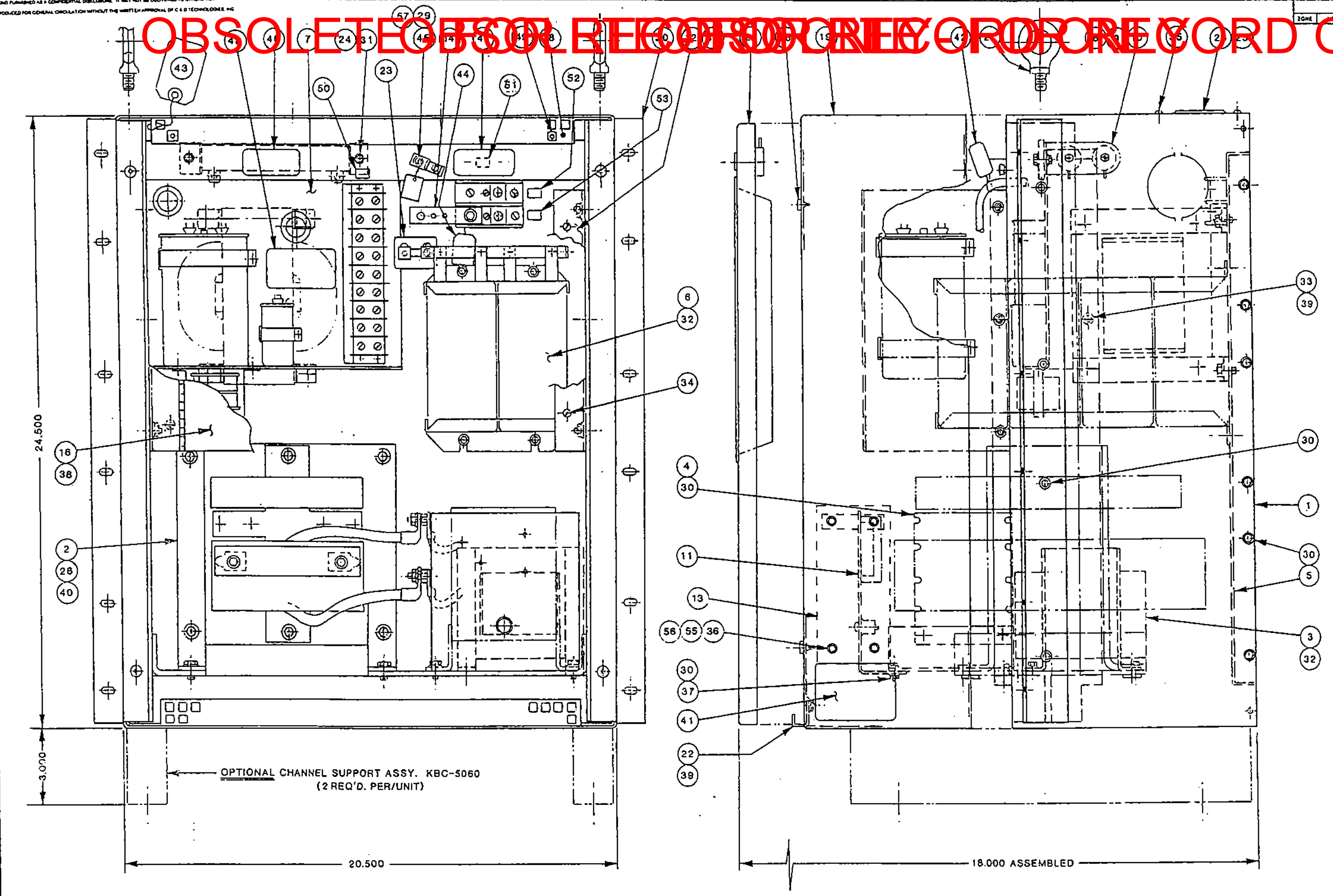
REMOVABLE FRONT PANEL	FOR ACCESS TO CONTROL PANEL TO MAKE MINOR ADJUSTMENTS AND TESTING.
REMOVABLE FRONT HALF	FOR PREVENTATIVE MAINTENANCE AND SERVICEABLY.
OPTIONAL CHANNEL SUPPORTS	FOR TABLE OR FLOOR MOUNTING

C&D TECHNOLOGIES, INC.
Power Solutions

GENERAL ARRANGEMENT
[illegible]T48AC100E, NEG GND

DRAWN	R.B.WEAVER 11-5-91
CHECKED	11-5-91
APPROVED	D.H. 11-7-91
SIZE	D
DWG. NO.	NBC-2470
SCALE	1/2
REV. NO.	
SHEET	1 OF 2

OBSOLETE - FOR RECORD ONLY



ITEM	DESCRIPTION
59	MOV ASSEMBLY
58	MOV ASSEMBLY
57	LUG
56	LOCKWASHER
55	STANDOFF
54	MOV ASSEMBLY
53	DECAL NEG
52	DECAL POS
51	DECAL TB2
50	DECAL TB1
49	NUT, SELF RETAINER
48	LABEL-CAUTION
47	LABEL-EMER SERVICE
46	LABEL- HIGH VOLTAGE
45	TAG-GRD ONLY
44	TAG-VOLTAGE CONNECTED FOR
43	TAG-INSTRUCTION & INSTALLATION
42	TAG-VOLTAGE SETTING
41	NAME PLATE
40	WASHER
39	NUT
38	NUT
37	NUT
36	SCREW
35	SCREW
34	SCREW
33	SCREW
32	SCREW
31	SCREW
30	SCREW
29	SCREW
28	SCREW
27	EYE BOLT
26	BUMPER SNAP-IN
25	CAPLUG
24	BUSHING, SNAP IN
23	SHUNT
22	FRONT PNL RETAINING CLIP
21	REMOVABLE FRONT DOOR
20	RACK MTG ANGLE
19	FRONT, HALF CAB WELDMENT
18	PERFORATED TOP
17	HARNESS ASSEM
16	INSTRUMENT PANEL
14	BUSBAR, TERMINAL BLOCK
13	CIRCUIT BOARD
12	SIDE RAIL RH
11	ACCESSORY PANEL
10	BOLT, MICA/CTRG WASHERS
9	RESISTOR BRACKET MTG.
8	RESISTOR
7	RESN CAP ASSY
6	FILTER ASSY
5	BACK PANEL ASSY.
4	RECTIFIER ASSY
3	CHOKE
2	TRANSFORMER
1	BACK HALF CAB WELDMENT

NOTE: SEE WIRING DIAGRAM FOR ITEM 54, 58 AND 59.

DRAWN	E.B. WEBER	11-4-91
CHECKED	[signature]	11-5-91
APPROVED	D.K. Mulhad	11-7-91
APPROVED		
APPROVED		

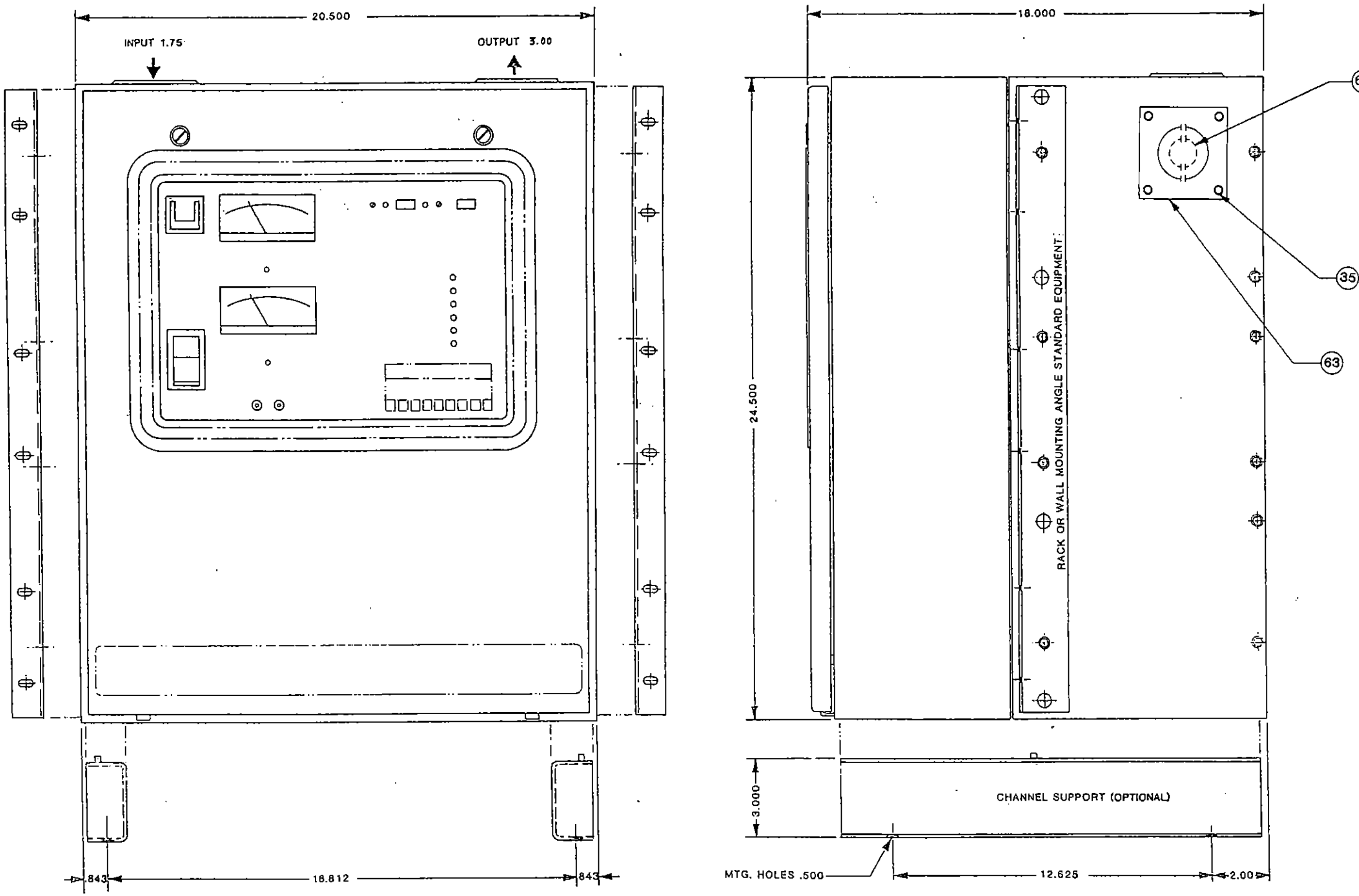
C&D TECHNOLOGIES, INC.
Power Solutions

GENERAL ARRANGEMENT
RT48AC100E, NEG GND

SIZE D | CODE IDENT. NO. | NBC-2470
SCALE 1/2 | REV. | SHEET 2 OF 2

OBSOLETE-FOR RECORD ONLY

ZONE	NO.	DESCRIPTION	DATE	APPROVED
	1	SEE ECN 9965	12/13/93	DWH
	2	SEE ECN 10533	10/10/95	MCM



CABINET FEATURES

REMOVABLE FRONT PANEL — FOR ACCESS TO CONTROL PANEL TO MAKE MINOR ADJUSTMENTS AND TESTING.

REMOVABLE FRONT HALF — FOR PREVENTATIVE MAINTENANCE AND SERVICEABLY.

OPTIONAL CHANNEL SUPPORTS — FOR FLOOR MOUNTING.

ISSUE	DATE	QTY
CONSTRUCTION	10-21-91	4

DRAWN	DATE
R.B.WEBER	10-30-91
CHECKED D.B.	10-31-91
APPROVED D.H.	10-4-91

MATERIAL:

CD TECHNOLOGIES, INC. Power Solutions

GENERAL ARRANGEMENT
HRT48AC100U

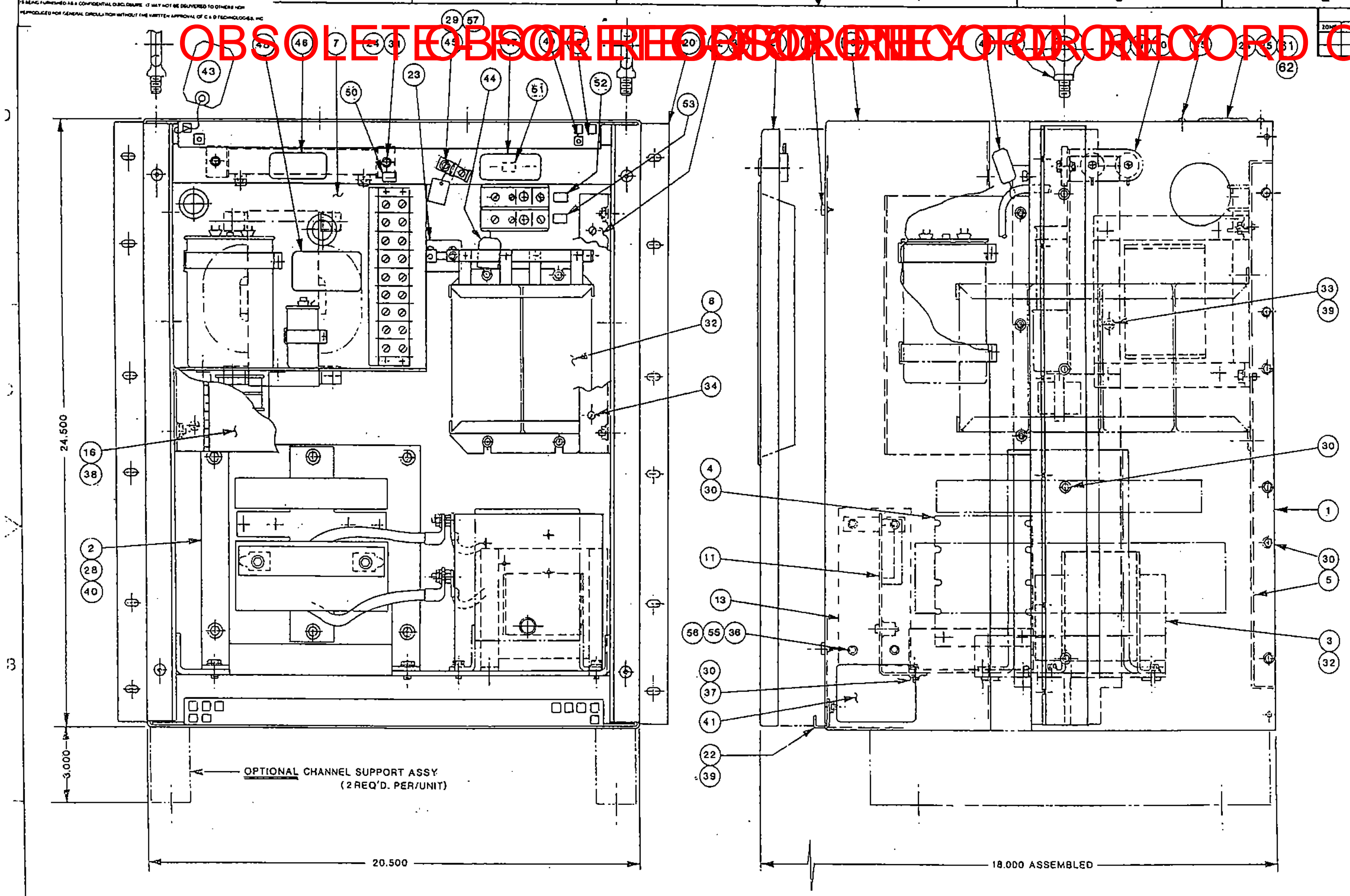
SIZE D | NBC-2465

SCALE 1/2 | REV. NO. 2 | SHEET 1 OF 2

NBC-2465

REVISIONS

ZONE	NO.	DESCRIPTION	DATE	APPROVED
		SEE ECN 5	12/13/93	
		SEE ECN 10133	10/16/95	



ITEM	DESCRIPTION
64	COVER PLATE
63	COVER PLATE
62	BUSHING, SNAP-IN
61	PLUG
59	MOV ASSEMBLY
58	MOV ASSEMBLY
57	LUG
56	LOCKWASHER
55	STANDOFF
54	MOV ASSEMBLY
53	DECAL NEG
52	DECAL POS
51	DECAL TB2
50	DECAL TB1
49	NUT, SELF RETAINER
48	LABEL-CAUTION
47	LABEL-EMER SERVICE
46	LABEL- HIGH VOLTAGE
45	TAG-GRD ONLY
44	TAG-VOLTAGE CONNECTED FOR
43	TAG-INSTRUCTION & INSTALLATION
42	TAG-VOLTAGE SETTING
41	NAME PLATE
40	WASHER
39	NUT
38	NUT
37	NUT
36	SCREW
35	SCREW
34	SCREW
33	SCREW
32	SCREW
31	SCREW
30	SCREW
29	SCREW
28	SCREW
27	EYE BOLT
26	BUMPER SNAP-IN
25	CAPLUG
24	BUSHING, SNAP IN
23	SHUNT
22	FRONT PNL RETAINING CLIP
21	REMOVABLE FRONT DOOR
20	RACK MTG ANGLE
19	FRONT HALF CAB WELDMENT
18	PERFORATED TOP
17	HARNESS ASSEM
16	INSTRUMENT PANEL
13	CIRCUIT BOARD
12	SIDE RAIL RH
11	ACCESSORY PANEL
10	BOLT, MICA/CTRG WASHERS
9	RESISTOR BRACKET MTG.
8	RESISTOR
7	RESN CAP ASSY
6	FILTER ASSY
5	BACK PANEL ASSY.
4	RECTIFIER ASSY
3	CHOKE
2	TRANSFORMER
1	BACK HALF CAB WELDMENT

NOTE: SEE WIRING DIAGRAM DRAWING FOR ITEMS 54, 58 & 59.

SEQ. 6, 9, 10 MAY BE IN AN ASSEMBLY.

DRAWN R.B.WEBER 10-30-91

CHECKED 10-31-91

APPROVED 10-31-91

C&D TECHNOLOGIES, INC.

Power Solutions

GENERAL ARRANGEMENT

HRT48AC100U

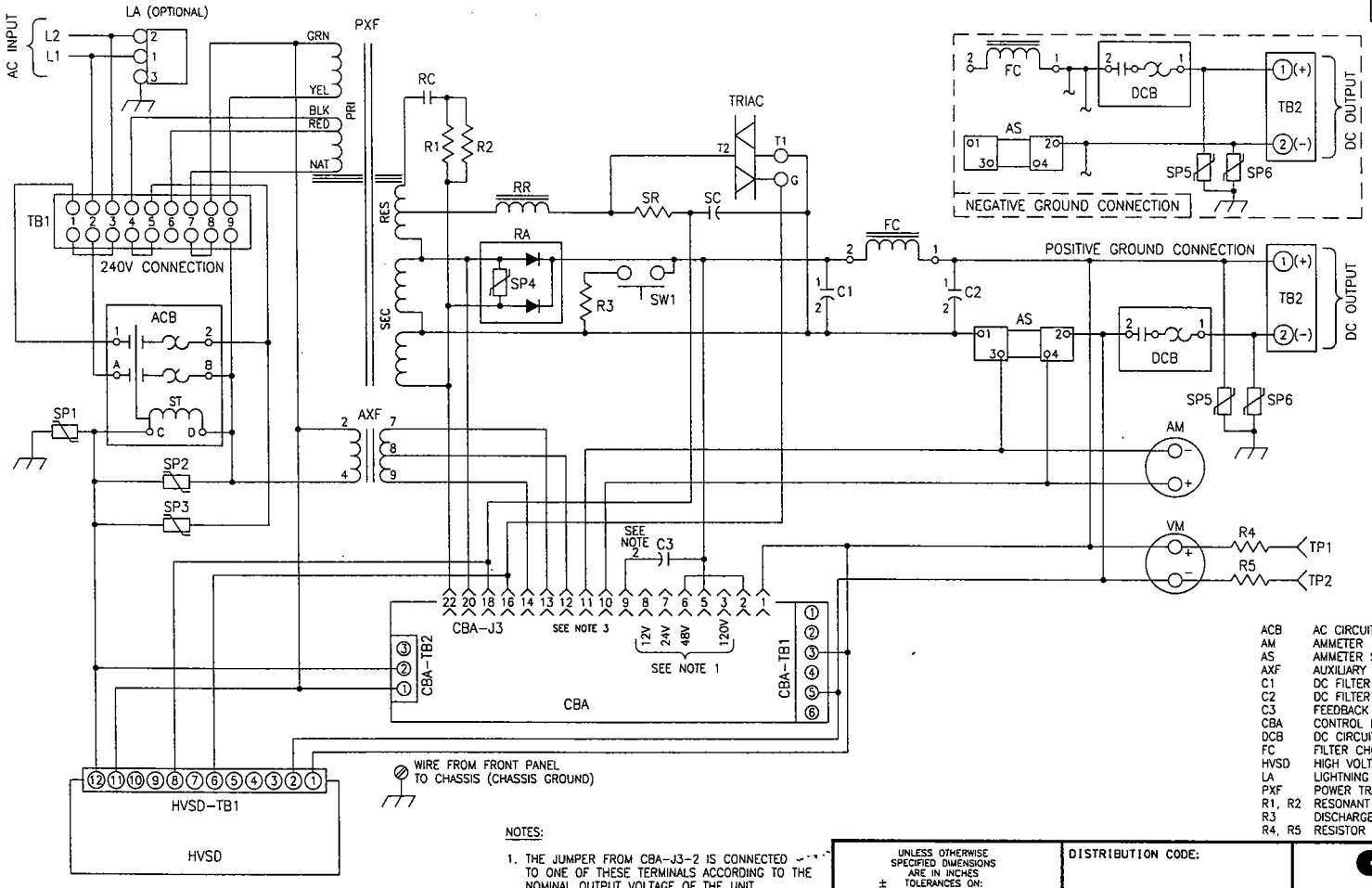
SIZE D

NBC-2465

SCALE 1/2 REV. 2 SHEET 2 OF 2

REVISIONS

REVISION LEVEL	DESCRIPTION	REV. BY REV. DATE	APPROVED BY APPROVED DATE
1	SEE ECN 12520	KEL 09/01/99	9/28/99



LEGEND

ACB	AC CIRCUIT BREAKER	RA	RECTIFIER ASSEMBLY
AM	AMMETER	RC	RESONANT CAPACITOR
AS	AMMETER SHUNT	RR	RESONANT REACTOR
AXF	AUXILIARY TRANSFORMER	SC	SNUBBER CAPACITOR
C1	DC FILTER CAPACITOR–INPUT	SP1–6	SURGE PROTECTOR
C2	DC FILTER CAPACITOR–OUTPUT	SR	SNUBBER RESISTOR
C3	FEEDBACK CAPACITOR	ST	SHUNT TRIP COIL
CBA	CONTROL BOARD	SW1	CAPACITOR DISCHARGE SWITCH
DCB	DC CIRCUIT BREAKER	TB1	TERMINAL BLOCK PXF TERMINATION
FC	FILTER CHOKE	TB2	TERMINAL BLOCK DC OUTPUT
HVSD	HIGH VOLTAGE SHUTDOWN	TP1	POSITIVE OUTPUT TEST JACK
LA	LIGHTNING ARRESTER	TP2	NEGATIVE OUTPUT TEST JACK
PXF	POWER TRANSFORMER	TRIAC	RESONANT CONTROL THYRISTOR
R1, R2	RESONANT RESISTOR	VM	DC VOLTMETER
R3	DISCHARGE RESISTOR		
R4, R5	RESISTOR		

NOTES:

1. THE JUMPER FROM CBA–J3–2 IS CONNECTED TO ONE OF THESE TERMINALS ACCORDING TO THE NOMINAL OUTPUT VOLTAGE OF THE UNIT.
2. C3 MAY NOT BE PRESENT IN ALL MODELS.
3. J3 ON CBA IS MARKED OPPOSITE OF CONNECTOR MARKINGS. EXAMPLE: CBA–J3–2 IS CONNECTOR 21 AND CBA–J3–20 IS CONNECTOR 3.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON:

± FRACTIONS	DECIMALS XX	DECIMALS XXX	ANGLES
±1/32	0.020	0.010	±1°

MATERIAL:

BLANK SIZE:

APPROVALS	DATE
DRAWN G. D. HAWKINS	05/09/91
CHECKED P. A. O' CONNOR	07/08/91
APPROVED [illegible]	07/09/91

DISTRIBUTION CODE:

C&D TECHNOLOGIES, INC.
Power Solutions

SCHEMATIC DIAGRAM, HRT
1P DC BREAKER WITH ANALOG METERS

SIZE	RATING	DOC TYPE / NUMBER	REVISION
B	STANDARD	MDC-5524	1
SCALE: NONE		SHEET: 1 OF 1	FILE NAME: MDC5524_SHT_1_ISS_1

REVISIONS			
REVISION LEVEL	DESCRIPTION	REV. BY REV. DATE	APPROVED BY APPROVED DATE
1	SEE ECN 12520	KEL 09/01/99	9/28/99

LA (OPTIONAL)
AC INPUT
L2
L1
PXF
GRN
YEL
BLK
RED
NAT
PRI
RES
SEC
RC
R1
R2
TRIAC
T1
T2
G
RR
SR
SC
RA
SP4
R3
SW1
FC
C1
C2
AS
DCB
TB2
(+)
(-)
DC OUTPUT
TB1
240V CONNECTION
ACB
ST
SP1
SP2
SP3
AXF
SP6
SP5
AM
VM
R4
R5
TP1
TP2
SEE NOTE C3
CBA-J3
SEE NOTE 3
12V
24V
48V
120V
SEE NOTE 1
CBA-TB2
CBA-TB1
CBA
WIRE FROM FRONT PANEL TO CHASSIS (CHASSIS GROUND)
HVSD-TB1
HVSD
120V CONNECTION
208V CONNECTION

LEGEND

ACB	AC CIRCUIT BREAKER	RA	RECTIFIER ASSEMBLY
AM	AMMETER	RC	RESONANT CAPACITOR
AS	AMMETER SHUNT	RR	RESONANT REACTOR
AXF	AUXILIARY TRANSFORMER	SC	SNUBBER CAPACITOR
C1	DC FILTER CAPACITOR–INPUT	SP1–6	SURGE PROTECTOR
C2	DC FILTER CAPACITOR–OUTPUT	SR	SNUBBER RESISTOR
C3	FEEDBACK CAPACITOR	ST	SHUNT TRIP COIL
CBA	CONTROL BOARD	SW1	CAPACITOR DISCHARGE SWITCH
DCB	DC CIRCUIT BREAKER	TB1	TERMINAL BLOCK PXF TERMINATION
FC	FILTER CHOKE	TB2	TERMINAL BLOCK DC OUTPUT
HVSD	HIGH VOLTAGE SHUTDOWN	TP1	POSITIVE OUTPUT TEST JACK
LA	LIGHTNING ARRESTER	TP2	NEGATIVE OUTPUT TEST JACK
PXF	POWER TRANSFORMER	TRIAC	RESONANT CONTROL THYRISTOR
R1, R2	RESONANT RESISTOR	VM	DC VOLTMETER
R3	DISCHARGE RESISTOR		
R4, R5	RESISTOR		

NOTES:

1. THE JUMPER FROM CBA–J3–2 IS CONNECTED TO ONE OF THESE TERMINALS ACCORDING TO THE NOMINAL OUTPUT VOLTAGE OF THE UNIT.
2. C3 MAY NOT BE PRESENT IN ALL MODELS.
3. J3 ON CBA IS MARKED OPPOSITE OF CONNECTOR MARKINGS. EXAMPLE: CBA–J3–2 IS CONNECTOR 21 AND CBA–J3–20 IS CONNECTOR 3.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ON:

FRACTIONS	DECIMALS		ANGLES
	XX	XXX	
±1/32	0.020	0.010	±1°

MATERIAL:
BLANK SIZE:

DISTRIBUTION CODE:

APPROVALS	DATE
DRAWN G. D. HAWKINS	05/09/91
CHECKED D. B. WILSON	07/30/91
APPROVED D. H. MUHLBAUER	07/30/91
APPROVED	

C&D TECHNOLOGIES, INC.
Power Solutions

SCHEMATIC DIAGRAM, HRT UTILITY 2P DC BREAKER WITH ANALOG METERS

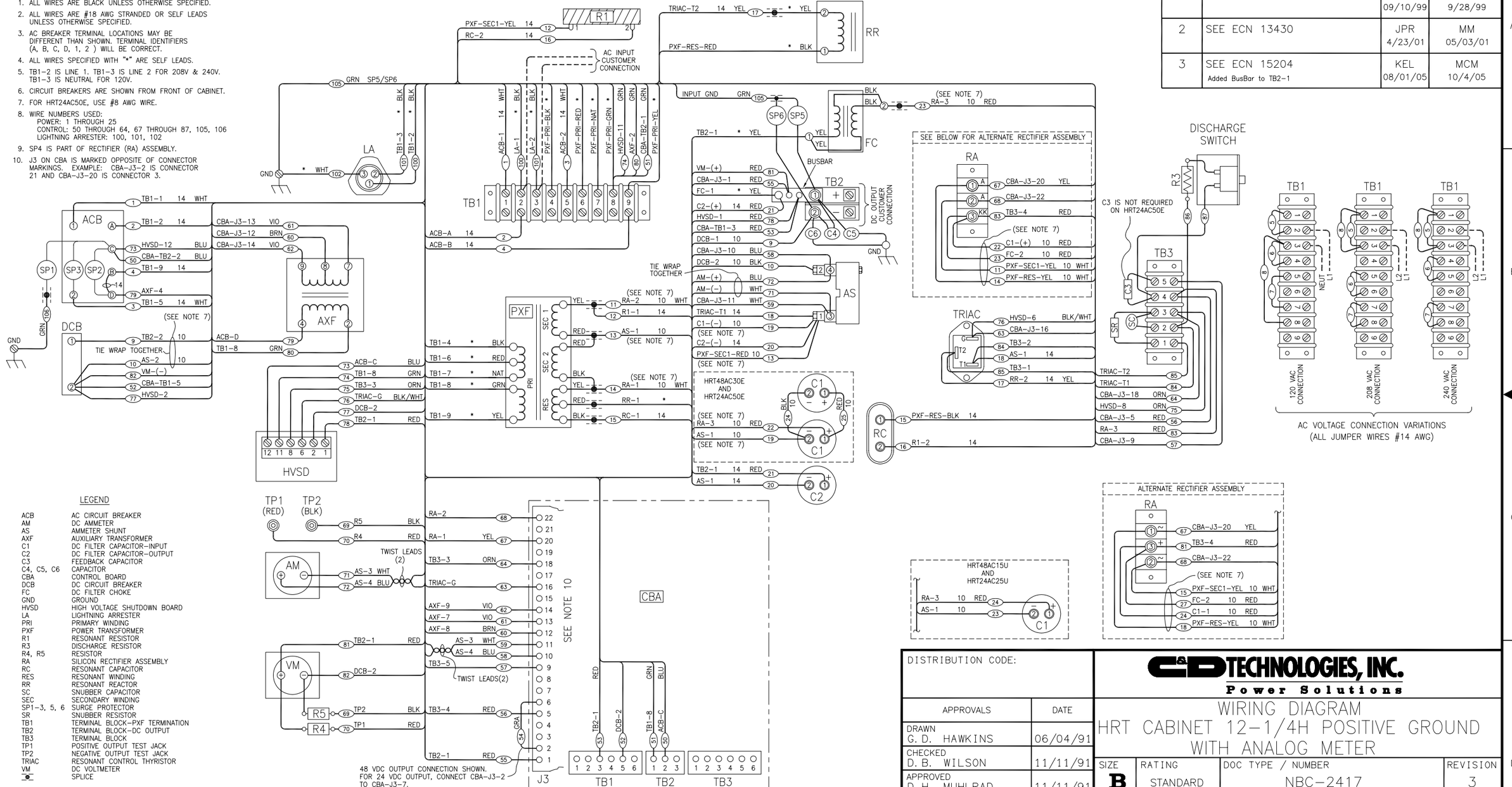
SIZE	RATING	DOC TYPE / NUMBER	REVISION
B	STANDARD	MBC-5490	1
SCALE: NONE	SHEET: 1 OF 1	FILE NAME: MBC5490_SHT_1_ISS_1	

OBSOLETE - FOR RECORD ONLY

NOTES:

1. ALL WIRES ARE BLACK UNLESS OTHERWISE SPECIFIED.
2. ALL WIRES ARE #18 AWG STRANDED OR SELF LEADS UNLESS OTHERWISE SPECIFIED.
3. AC BREAKER TERMINAL LOCATIONS MAY BE DIFFERENT THAN SHOWN. TERMINAL IDENTIFIERS (A, B, C, D, 1, 2) WILL BE CORRECT.
4. ALL WIRES SPECIFIED WITH "*" ARE SELF LEADS.
5. TB1–2 IS LINE 1. TB1–3 IS LINE 2 FOR 208V & 240V. TB1–3 IS NEUTRAL FOR 120V.
6. CIRCUIT BREAKERS ARE SHOWN FROM FRONT OF CABINET.
7. FOR HRT24AC50E, USE #8 AWG WIRE.
8. WIRE NUMBERS USED:
   POWER: 1 THROUGH 25
   CONTROL: 50 THROUGH 64, 67 THROUGH 87, 105, 106
   LIGHTNING ARRESTER: 100, 101, 102
9. SP4 IS PART OF RECTIFIER (RA) ASSEMBLY.
10. J3 ON CBA IS MARKED OPPOSITE OF CONNECTOR MARKINGS. EXAMPLE: CBA–J3–2 IS CONNECTOR 21 AND CBA–J3–20 IS CONNECTOR 3.

REVISIONS			
REVISION LEVEL	DESCRIPTION	REV. BY REV. DATE	APPROVED BY APPROVED DATE
1	SEE ECN 12520	KEL 09/10/99	MM 9/28/99
2	SEE ECN 13430	JPR 4/23/01	MM 05/03/01
3	SEE ECN 15204 Added BusBar to TB2–1	KEL 08/01/05	MCM 10/4/05



LEGEND

ACB	AC CIRCUIT BREAKER
AM	DC AMMETER
AS	AMMETER SHUNT
AXF	AUXILIARY TRANSFORMER
C1	DC FILTER CAPACITOR–INPUT
C2	DC FILTER CAPACITOR–OUTPUT
C3	FEEDBACK CAPACITOR
C4, C5, C6	CAPACITOR
CBA	CONTROL BOARD
DCB	DC CIRCUIT BREAKER
FC	DC FILTER CHOKE
GND	GROUND
HVSD	HIGH VOLTAGE SHUTDOWN BOARD
LA	LIGHTNING ARRESTER
PRI	PRIMARY WINDING
PXF	POWER TRANSFORMER
R1	RESONANT RESISTOR
R3	DISCHARGE RESISTOR
R4, R5	RESISTOR
RA	SILICON RECTIFIER ASSEMBLY
RC	RESONANT CAPACITOR
RES	RESONANT WINDING
RR	RESONANT REACTOR
SC	SNUBBER CAPACITOR
SEC	SECONDARY WINDING
SP1–3, 5, 6	SURGE PROTECTOR
SR	SNUBBER RESISTOR
TB1	TERMINAL BLOCK–PXF TERMINATION
TB2	TERMINAL BLOCK–DC OUTPUT
TB3	TERMINAL BLOCK
TP1	POSITIVE OUTPUT TEST JACK
TP2	NEGATIVE OUTPUT TEST JACK
TRIAC	RESONANT CONTROL THYRISTOR
VM	DC VOLTMETER
	SPLICE

DISTRIBUTION CODE:

C&D TECHNOLOGIES, INC. Power Solutions

APPROVALS	DATE
DRAWN G. D. HAWKINS	06/04/91
CHECKED D. B. WILSON	11/11/91
APPROVED D. H. MUHLRAD	11/11/91
APPROVED	

BLANK SIZE:

WIRING DIAGRAM HRT CABINET 12–1/4H POSITIVE GROUND WITH ANALOG METER

SIZE	RATING	DOC TYPE / NUMBER	REVISION
B	STANDARD	NBC–2417	3

SCALE: NONE SHEET: 1 OF 1 FILE NAME: NBC2417_SHT_1_ISS_3

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES ± TOLERANCES ON:

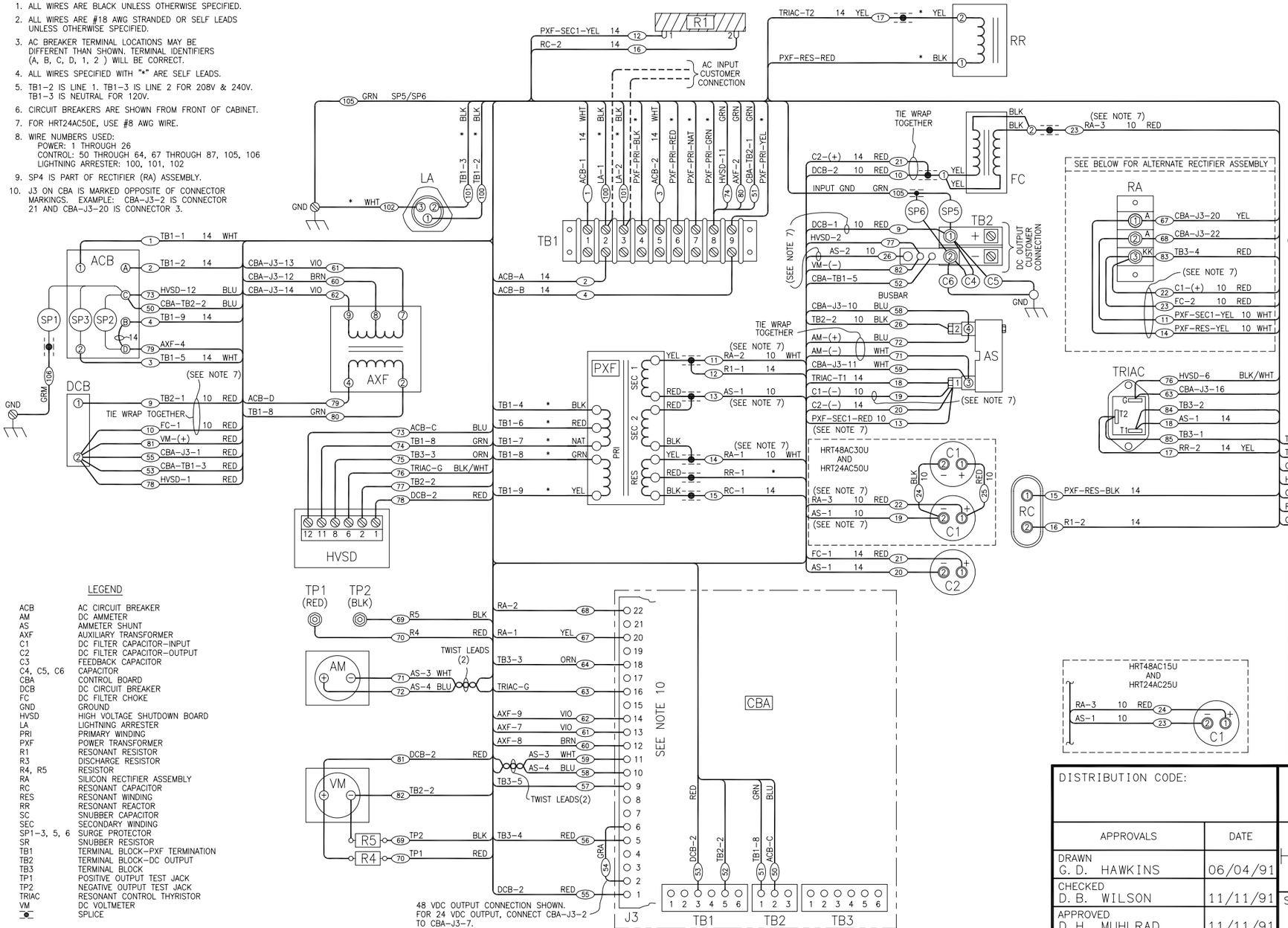
FRACTIONS	DECIMALS XX	DECIMALS XXX	ANGLES
±1/32	0.020	0.010	±1°

OBSOLETE - FOR RECORD ONLY
OBSOLETE - FOR RECORD ONLY

NOTES:

1. ALL WIRES ARE BLACK UNLESS OTHERWISE SPECIFIED.
2. ALL WIRES ARE #18 AWG STRANDED OR SELF LEADS UNLESS OTHERWISE SPECIFIED.
3. AC BREAKER TERMINAL LOCATIONS MAY BE DIFFERENT THAN SHOWN. TERMINAL IDENTIFIERS (A, B, C, D, 1, 2) WILL BE CORRECT.
4. ALL WIRES SPECIFIED WITH "*" ARE SELF LEADS.
5. TB1–2 IS LINE 1. TB1–3 IS LINE 2 FOR 208V & 240V. TB1–3 IS NEUTRAL FOR 120V.
6. CIRCUIT BREAKERS ARE SHOWN FROM FRONT OF CABINET.
7. FOR HRT24AC50E, USE #8 AWG WIRE.
8. WIRE NUMBERS USED:
   POWER: 1 THROUGH 26
   CONTROL: 50 THROUGH 64, 67 THROUGH 87, 105, 106
   LIGHTNING ARRESTER: 100, 101, 102
9. SP4 IS PART OF RECTIFIER (RA) ASSEMBLY.
10. J3 ON CBA IS MARKED OPPOSITE OF CONNECTOR MARKINGS. EXAMPLE: CBA–J3–2 IS CONNECTOR 21 AND CBA–J3–20 IS CONNECTOR 3.

REVISIONS			
REVISION LEVEL	DESCRIPTION	REV. BY REV. DATE	APPROVED BY APPROVED DATE
2	SEE ECN 12520	KEL 09/16/99	MM 9/20/99
3	SEE ECN 13432	JPR 4/23/01	MM 05/03/01
4	SEE ECN 15204 Added BusBar to TB2–2.	KEL 08/01/05	MCM 10/4/05



LEGEND

ACB	AC CIRCUIT BREAKER
AM	DC AMMETER
AS	AMMETER SHUNT
AXF	AUXILIARY TRANSFORMER
C1	DC FILTER CAPACITOR–INPUT
C2	DC FILTER CAPACITOR–OUTPUT
C3	FEEDBACK CAPACITOR
C4, C5, C6	CAPACITOR
CBA	CONTROL BOARD
DCB	DC CIRCUIT BREAKER
FC	DC FILTER CHOKE
GND	GROUND
HVSD	HIGH VOLTAGE SHUTDOWN BOARD
LA	LIGHTNING ARRESTER
PRI	PRIMARY WINDING
PXF	POWER TRANSFORMER
R1	RESONANT RESISTOR
R3	DISCHARGE RESISTOR
R4, R5	RESISTOR
RA	SILICON RECTIFIER ASSEMBLY
RC	RESONANT CAPACITOR
RES	RESONANT WINDING
RR	RESONANT REACTOR
SC	SNUBBER CAPACITOR
SEC	SECONDARY WINDING
SP1–3, 5, 6	SURGE PROTECTOR
SR	SNUBBER RESISTOR
TB1	TERMINAL BLOCK–PXF TERMINATION
TB2	TERMINAL BLOCK–DC OUTPUT
TB3	TERMINAL BLOCK
TP1	POSITIVE OUTPUT TEST JACK
TP2	NEGATIVE OUTPUT TEST JACK
TRIAC	RESONANT CONTROL THYRISTOR
VM	DC VOLTMETER
	SPLICE

DISTRIBUTION CODE:

APPROVALS	DATE
DRAWN G. D. HAWKINS	06/04/91
CHECKED D. B. WILSON	11/11/91
APPROVED D. H. MUHLRAD	11/11/91
APPROVED	

BLANK SIZE:

C&D TECHNOLOGIES, INC. Power Solutions

WIRING DIAGRAM
HRT CABINET 12–1/4H NEGATIVE GROUND WITH ANALOG METER

SIZE	RATING	DOC TYPE / NUMBER	REVISION
B	STANDARD	NBC–2416	4

SCALE: NONE | SHEET: 1 OF 1 | FILE NAME: NBC2416_SHT_1_ISS_4

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES ± TOLERANCES ON:

FRACTIONS	DECIMALS XX	DECIMALS XXX	ANGLES
±1/32	0.020	0.010	±1°

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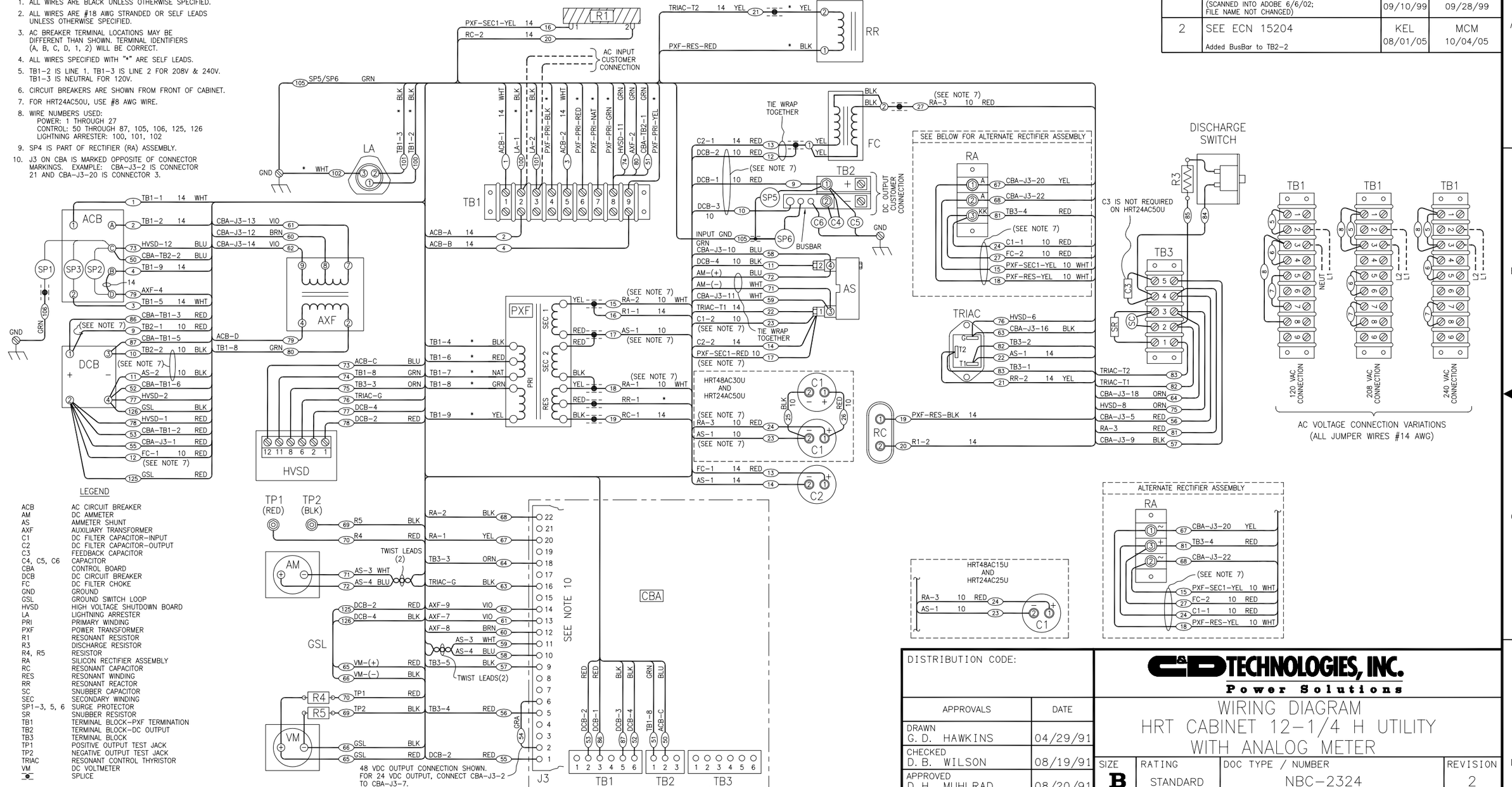
NOTES:

1. ALL WIRES ARE BLACK UNLESS OTHERWISE SPECIFIED.
2. ALL WIRES ARE #18 AWG STRANDED OR SELF LEADS UNLESS OTHERWISE SPECIFIED.
3. AC BREAKER TERMINAL LOCATIONS MAY BE DIFFERENT THAN SHOWN. TERMINAL IDENTIFIERS (A, B, C, D, 1, 2) WILL BE CORRECT.
4. ALL WIRES SPECIFIED WITH "*" ARE SELF LEADS.
5. TB1–2 IS LINE 1. TB1–3 IS LINE 2 FOR 208V & 240V. TB1–3 IS NEUTRAL FOR 120V.
6. CIRCUIT BREAKERS ARE SHOWN FROM FRONT OF CABINET.
7. FOR HRT24AC50U, USE #8 AWG WIRE.
8. WIRE NUMBERS USED:
   POWER: 1 THROUGH 27
   CONTROL: 50 THROUGH 87, 105, 106, 125, 126
   LIGHTNING ARRESTER: 100, 101, 102
9. SP4 IS PART OF RECTIFIER (RA) ASSEMBLY.
10. J3 ON CBA IS MARKED OPPOSITE OF CONNECTOR MARKINGS. EXAMPLE: CBA–J3–2 IS CONNECTOR 21 AND CBA–J3–20 IS CONNECTOR 3.

REVISIONS			
REVISION LEVEL	DESCRIPTION	REV. BY REV. DATE	APPROVED BY APPROVED DATE
1	SEE ECN 12520 (SCANNED INTO ADOBE 6/6/02; FILE NAME NOT CHANGED)	KEL 09/10/99	MCM 09/28/99
2	SEE ECN 15204 Added BusBar to TB2–2	KEL 08/01/05	MCM 10/04/05



LEGEND

ACB	AC CIRCUIT BREAKER
AM	DC AMMETER
AS	AMMETER SHUNT
AXF	AUXILIARY TRANSFORMER
C1	DC FILTER CAPACITOR–INPUT
C2	DC FILTER CAPACITOR–OUTPUT
C3	FEEDBACK CAPACITOR
C4, C5, C6	CAPACITOR
CBA	CONTROL BOARD
DCB	DC CIRCUIT BREAKER
FC	DC FILTER CHOKE
GND	GROUND
GSL	GROUND SWITCH LOOP
HVSD	HIGH VOLTAGE SHUTDOWN BOARD
LA	LIGHTNING ARRESTER
PRI	PRIMARY WINDING
PXF	POWER TRANSFORMER
R1	RESONANT RESISTOR
R3	DISCHARGE RESISTOR
R4, R5	RESISTOR
RA	SILICON RECTIFIER ASSEMBLY
RC	RESONANT CAPACITOR
RES	RESONANT WINDING
RR	RESONANT REACTOR
SC	SNUBBER CAPACITOR
SEC	SECONDARY WINDING
SP1–3, 5, 6	SURGE PROTECTOR
SR	SNUBBER RESISTOR
TB1	TERMINAL BLOCK–PXF TERMINATION
TB2	TERMINAL BLOCK–DC OUTPUT
TB3	TERMINAL BLOCK
TP1	POSITIVE OUTPUT TEST JACK
TP2	NEGATIVE OUTPUT TEST JACK
TRIAC	RESONANT CONTROL THYRISTOR
VM	DC VOLTMETER
	SPLICE

DISTRIBUTION CODE:

APPROVALS	DATE
DRAWN G. D. HAWKINS	04/29/91
CHECKED D. B. WILSON	08/19/91
APPROVED D. H. MUHLRAD	08/20/91
APPROVED	

BLANK SIZE:

C&D TECHNOLOGIES, INC. Power Solutions

WIRING DIAGRAM HRT CABINET 12–1/4 H UTILITY WITH ANALOG METER

SIZE	RATING	DOC TYPE / NUMBER	REVISION
B	STANDARD	NBC–2324	2

SCALE: NONE | SHEET: 1 OF 1 | FILE NAME: NBC2324_SHT_1_ISS_2

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES ± TOLERANCES ON:

FRACTIONS	DECIMALS XX	DECIMALS XXX	ANGLES
±1/32	0.020	0.010	±1°

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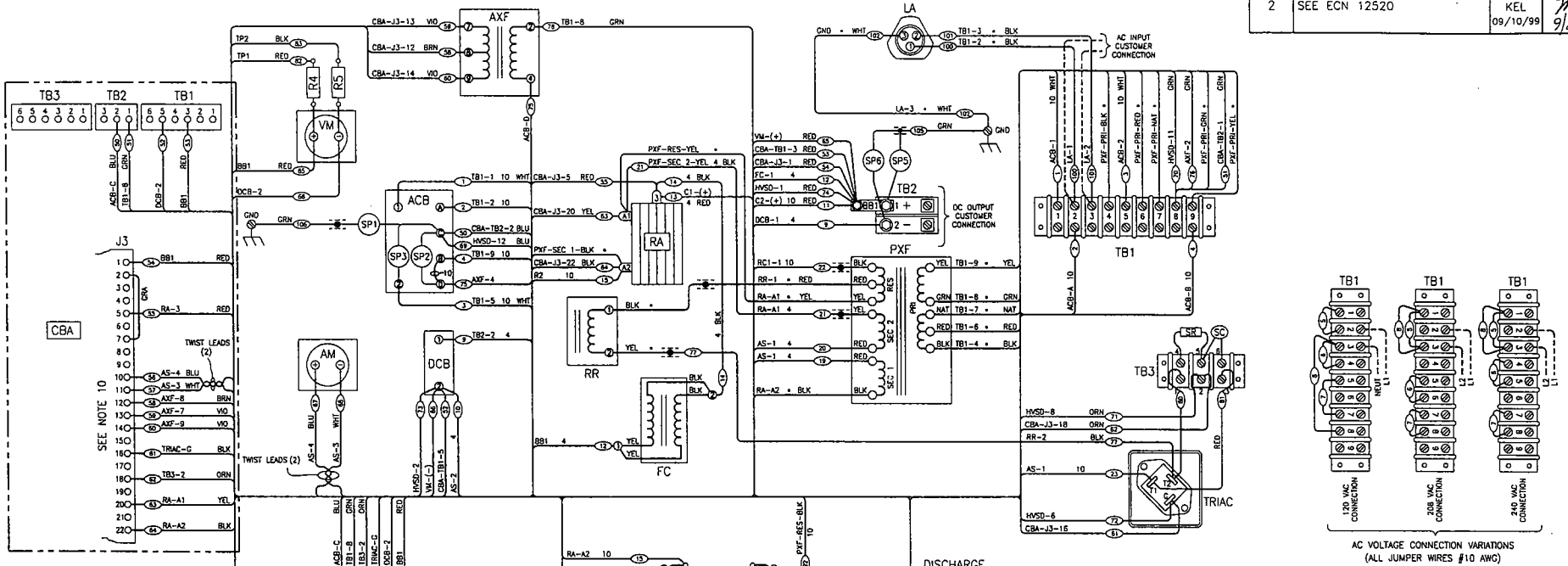
REVISIONS

REVISION LEVEL	DESCRIPTION	REV. BY REV. DATE	APPROVED BY APPROVED DATE
1	SEE ECN 10352	KEL 02/27/95	MCM 02/27/95
2	SEE ECN 12520	KEL 09/10/99	MM 9/28/99



LEGEND

A1, A2	ANODES, RECTIFIER ASSEMBLY
ACB	AC CIRCUIT BREAKER
AM	DC AMMETER
AS	AMMETER SHUNT
AXF	AUXILIARY TRANSFORMER
BB1	BUS BAR
C1	DC FILTER CAPACITOR-INPUT
C2	DC FILTER CAPACITOR-OUTPUT
CBA	CONTROL BOARD
DCB	DC CIRCUIT BREAKER
FC	DC FILTER CHOKE
GND	GROUND
HVSD	HIGH VOLTAGE SHUTDOWN BOARD
LA	LIGHTNING ARRESTER
PRI	PRIMARY WINDING
PXF	POWER TRANSFORMER
R1, R2	RESONANT RESISTOR
R4, R5	RESISTOR
RA	SILICON RECTIFIER ASSEMBLY
RC	RESONANT CAPACITOR
RES	RESONANT WINDING
RR	RESONANT REACTOR
TRIAC	RESONANT CONTROL THYRISTOR
SEC	SECONDARY WINDING
SC	SNUBBER CAPACITOR
SP1-3, 5, 6	SURGE PROTECTOR
SR	SNUBBER RESISTOR
TB1	TERMINAL BLOCK-PXF TERMINATION
TB2	TERMINAL BLOCK-DC OUTPUT
TB3	TERMINAL BLOCK
TP1	POSITIVE OUTPUT TEST JACK
TP2	NEGATIVE OUTPUT TEST JACK
VM	DC VOLTMETER
	SPLICE

NOTES:

1. ALL WIRES ARE BLACK UNLESS OTHERWISE SPECIFIED.
2. ALL WIRES ARE #18 AWG STRANDED OR SELF LEADS UNLESS OTHERWISE SPECIFIED.
3. AC BREAKER TERMINAL LOCATIONS MAY BE DIFFERENT THAN SHOWN. TERMINAL IDENTIFIERS (A, B, C, D, 1, 2) WILL BE CORRECT.
4. ALL WIRES SPECIFIED WITH "-" ARE SELF LEADS.
5. TB1-2 IS LINE 1. TB1-3 IS LINE 2 FOR 208V & 240V. TB1-1 IS NEUTRAL FOR 120V.
6. CIRCUIT BREAKERS ARE SHOWN FROM FRONT OF CABINET.
7. WIRE NUMBERS USED:
   POWER: 1 THROUGH 23
   CONTROL: 50 THROUGH 83, 103, 105
   LIGHTNING ARRESTER: 100, 101, 102
8. SP4 IS PART OF RECTIFIER (RA) ASSEMBLY.
10. J3 ON CBA IS MARKED OPPOSITE OF CONNECTOR MARKINGS. EXAMPLE: CBA-J3-2 IS CONNECTOR 21 AND CBA-J3-20 IS CONNECTOR 3.

DISTRIBUTION CODE:

APPROVALS	DATE
DRAWN G. D. HAWKINS	04/28/91
CHECKED D. B. WILSON	12/04/91
APPROVED P. S. ALEXANDER	12/05/91
APPROVED	

BLANK SIZE:

C&D TECHNOLOGIES, INC.
Power Solutions

WIRING DIAGRAM
HRT24AC100E POSITIVE GROUND
WITH ANALOG METERS

SIZE	RATING	DOC TYPE / NUMBER	REVISION
B	STANDARD	NBC-2327	2

SCALE: NONE | SHEET: 1 OF 1 | FILE NAME: NBC2327_SHT_1_ISS_2

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES ± TOLERANCES ON:

FRACTIONS	DECIMALS XX	DECIMALS XXX	ANGLES
±1/32	0.020	0.010	±1°

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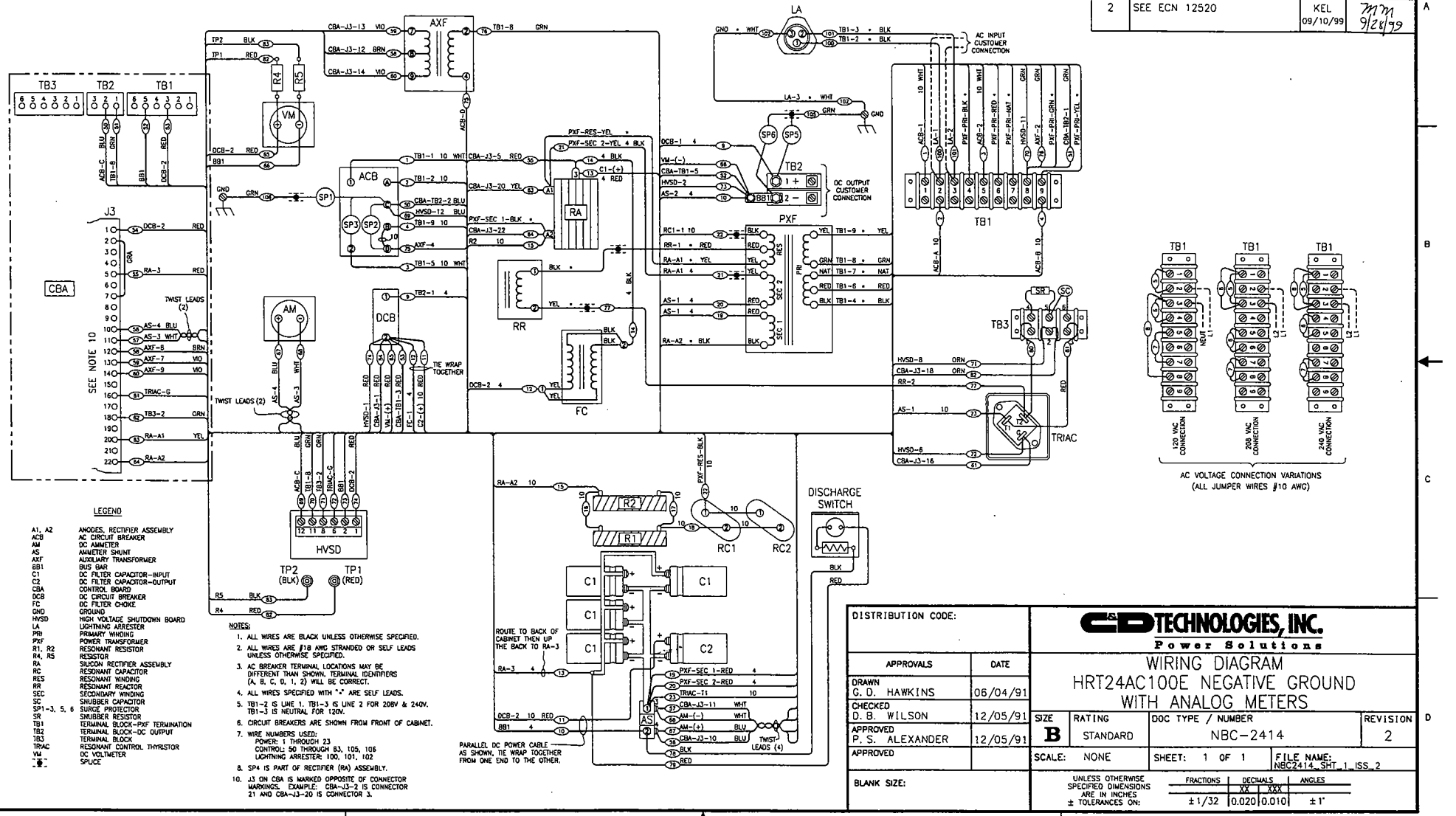
REVISIONS

REVISION LEVEL	DESCRIPTION	REV. BY REV. DATE	APPROVED BY APPROVED DATE
1	SEE ECN 10352	KEL 02/27/95	MCM 02/27/95
2	SEE ECN 12520	KEL 09/10/99	MM 9/28/99



LEGEND

A1, A2	ANODES, RECTIFIER ASSEMBLY
ACB	AC CIRCUIT BREAKER
AM	DC AMMETER
AS	AMMETER SHUNT
AXF	AUXILIARY TRANSFORMER
BB1	BUS BAR
C1	DC FILTER CAPACITOR-INPUT
C2	DC FILTER CAPACITOR-OUTPUT
CBA	CONTROL BOARD
DCB	DC CIRCUIT BREAKER
FC	DC FILTER CHOKE
GND	GROUND
HVSD	HIGH VOLTAGE SHUTDOWN BOARD
LA	LIGHTNING ARRESTER
PRI	PRIMARY WINDING
PXF	POWER TRANSFORMER
R1, R2	RESONANT RESISTOR
R4, R5	RESISTOR
RA	SILICON RECTIFIER ASSEMBLY
RC	RESONANT CAPACITOR
RES	RESONANT WINDING
RR	RESONANT REACTOR
SEC	SECONDARY WINDING
SC	SNUBBER CAPACITOR
SP1-3, 5, 6	SURGE PROTECTOR
SR	SNUBBER RESISTOR
TB1	TERMINAL BLOCK-PXF TERMINATION
TB2	TERMINAL BLOCK-DC OUTPUT
TB3	TERMINAL BLOCK
TRIAC	RESONANT CONTROL THYRISTOR
VM	DC VOLTMETER
	SPUCE

NOTES:

1. ALL WIRES ARE BLACK UNLESS OTHERWISE SPECIFIED.
2. ALL WIRES ARE #10 AWG STRANDED OR SELF LEADS UNLESS OTHERWISE SPECIFIED.
3. AC BREAKER TERMINAL LOCATIONS MAY BE DIFFERENT THAN SHOWN. TERMINAL IDENTIFIERS (A, B, C, D, 1, 2) WILL BE CORRECT.
4. ALL WIRES SPECIFIED WITH "-" ARE SELF LEADS.
5. TB1-2 IS LINE 1. TB1-3 IS LINE 2 FOR 208V & 240V. TB1-3 IS NEUTRAL FOR 120V.
6. CIRCUIT BREAKERS ARE SHOWN FROM FRONT OF CABINET.
7. WIRE NUMBERS USED:
   POWER: 1 THROUGH 23
   CONTROL: 50 THROUGH 83, 105, 106
   LIGHTNING ARRESTER: 100, 101, 102
8. SP4 IS PART OF RECTIFIER (RA) ASSEMBLY.
10. J3 ON CBA IS MARKED OPPOSITE OF CONNECTOR MARKINGS. EXAMPLE: CBA-J3-2 IS CONNECTOR 21 AND CBA-J3-20 IS CONNECTOR 3.

DISTRIBUTION CODE:

APPROVALS	DATE
DRAWN G. D. HAWKINS	06/04/91
CHECKED D. B. WILSON	12/05/91
APPROVED P. S. ALEXANDER	12/05/91
APPROVED	

BLANK SIZE:

C&D TECHNOLOGIES, INC.
Power Solutions

WIRING DIAGRAM
HRT24AC100E NEGATIVE GROUND WITH ANALOG METERS

SIZE	RATING	DOC TYPE / NUMBER	REVISION
B	STANDARD	NBC-2414	2

SCALE: NONE | SHEET: 1 OF 1 | FILE NAME: NBC2414_SHT_1_ISS_2

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES ± TOLERANCES ON:

FRACTIONS	DECIMALS XX	DECIMALS XXX	ANGLES
±1/32	0.020	0.010	±1°

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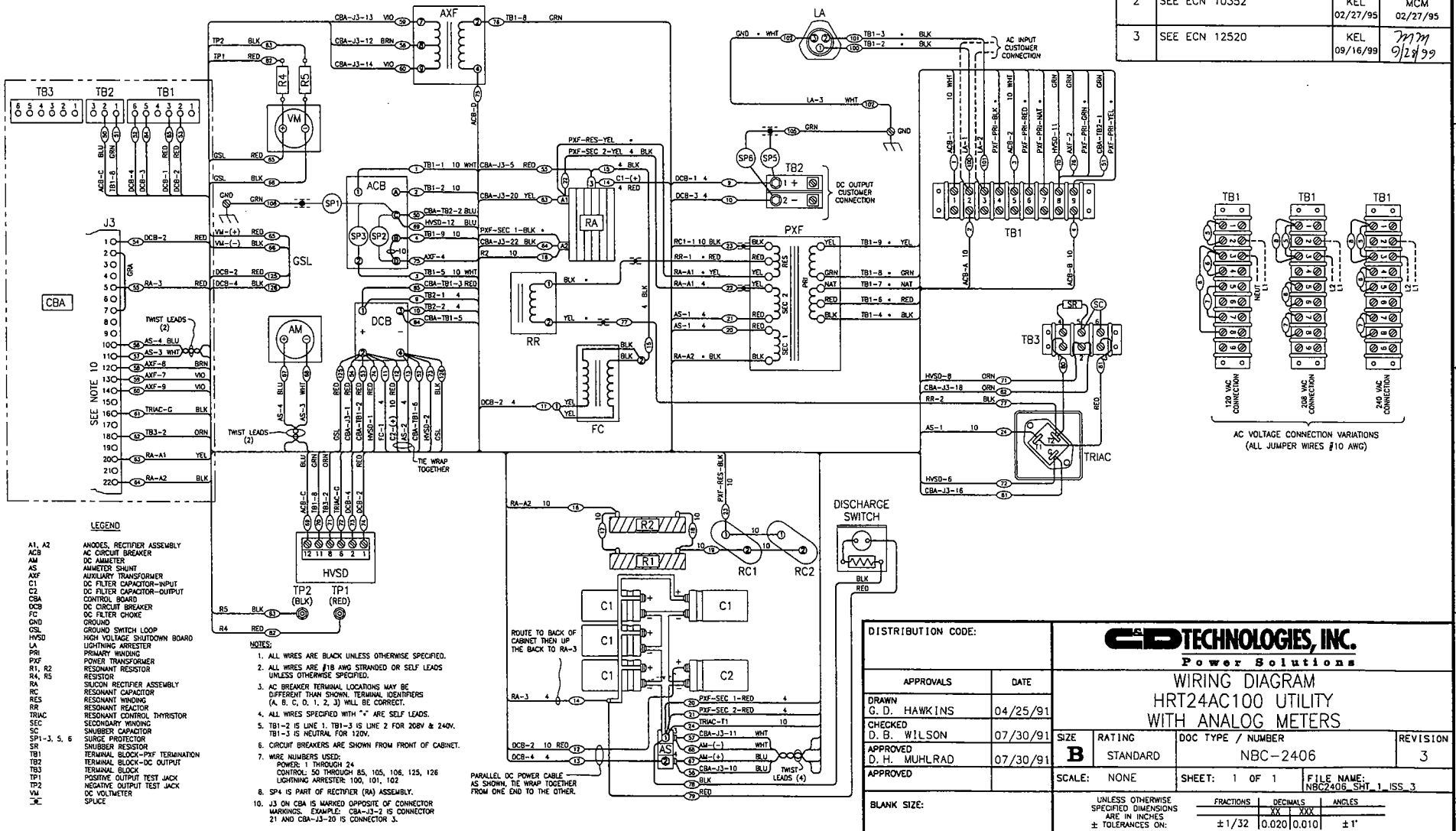
REVISIONS

REVISION LEVEL	DESCRIPTION	REV. BY REV. DATE	APPROVED BY APPROVED DATE
1	SEE ECN 10054	KEL 03/24/94	MCM 03/24/94
2	SEE ECN 10352	KEL 02/27/95	MCM 02/27/95
3	SEE ECN 12520	KEL 09/16/99	MM 9/28/99



LEGEND

A1, A2	ANODES, RECTIFIER ASSEMBLY
ACB	AC CIRCUIT BREAKER
AM	DC AMMETER
AS	AMMETER SHUNT
AXF	AUXILIARY TRANSFORMER
C1	DC FILTER CAPACITOR-INPUT
C2	DC FILTER CAPACITOR-OUTPUT
CBA	CONTROL BOARD
DCB	DC CIRCUIT BREAKER
FC	DC FILTER CHOKE
GND	GROUND
GSL	GROUND SWITCH LOOP
HVSD	HIGH VOLTAGE SHUTDOWN BOARD
LA	LIGHTNING ARRESTER
PRI	PRIMARY WINDING
PXF	POWER TRANSFORMER
R1, R2	RESONANT RESISTOR
R4, R5	RESISTOR
RA	SILICON RECTIFIER ASSEMBLY
RC	RESONANT CAPACITOR
RES	RESONANT WINDING
RR	RESONANT REACTOR
TRIAC	RESONANT CONTROL THYRISTOR
SEC	SECONDARY WINDING
SC	SNUBBER CAPACITOR
SP1-3, 5, 6	SURGE PROTECTOR
SR	SNUBBER RESISTOR
TB1	TERMINAL BLOCK-PXF TERMINATION
TB2	TERMINAL BLOCK-DC OUTPUT
TB3	TERMINAL BLOCK
TP1	POSITIVE OUTPUT TEST JACK
TP2	NEGATIVE OUTPUT TEST JACK
VM	DC VOLTMETER
⊸⊷	SPLICE

NOTES:

1. ALL WIRES ARE BLACK UNLESS OTHERWISE SPECIFIED.
2. ALL WIRES ARE #18 AWG STRANDED OR SELF LEADS UNLESS OTHERWISE SPECIFIED.
3. AC BREAKER TERMINAL LOCATIONS MAY BE DIFFERENT THAN SHOWN. TERMINAL IDENTIFIERS (A, B, C, 0, 1, 2, 3) WILL BE CORRECT.
4. ALL WIRES SPECIFIED WITH "+" ARE SELF LEADS.
5. TB1-2 IS LINE 1. TB1-3 IS LINE 2 FOR 208V & 240V. TB1-3 IS NEUTRAL FOR 120V.
6. CIRCUIT BREAKERS ARE SHOWN FROM FRONT OF CABINET.
7. WIRE NUMBERS USED:
   POWER: 1 THROUGH 24
   CONTROL: 50 THROUGH 85, 105, 106, 125, 126
   LIGHTNING ARRESTER: 100, 101, 102
8. SP4 IS PART OF RECTIFIER (RA) ASSEMBLY.
10. J3 ON CBA IS MARKED OPPOSITE OF CONNECTOR MARKINGS. EXAMPLE: CBA-J3-2 IS CONNECTOR 21 AND CBA-J3-20 IS CONNECTOR 3.

DISTRIBUTION CODE:

APPROVALS	DATE
DRAWN G. D. HAWKINS	04/25/91
CHECKED D. B. WILSON	07/30/91
APPROVED D. H. MUHLRAD	07/30/91
APPROVED	

BLANK SIZE:

C&D TECHNOLOGIES, INC.
Power Solutions

WIRING DIAGRAM
HRT24AC100 UTILITY
WITH ANALOG METERS

SIZE	RATING	DOC TYPE / NUMBER	REVISION
B	STANDARD	NBC-2406	3

SCALE: NONE | SHEET: 1 OF 1 | FILE NAME: NBC2406_SHT_1_ISS_3

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES ± TOLERANCES ON:

FRACTIONS	DECIMALS XX	DECIMALS XXX	ANGLES
±1/32	0.020	0.010	±1°

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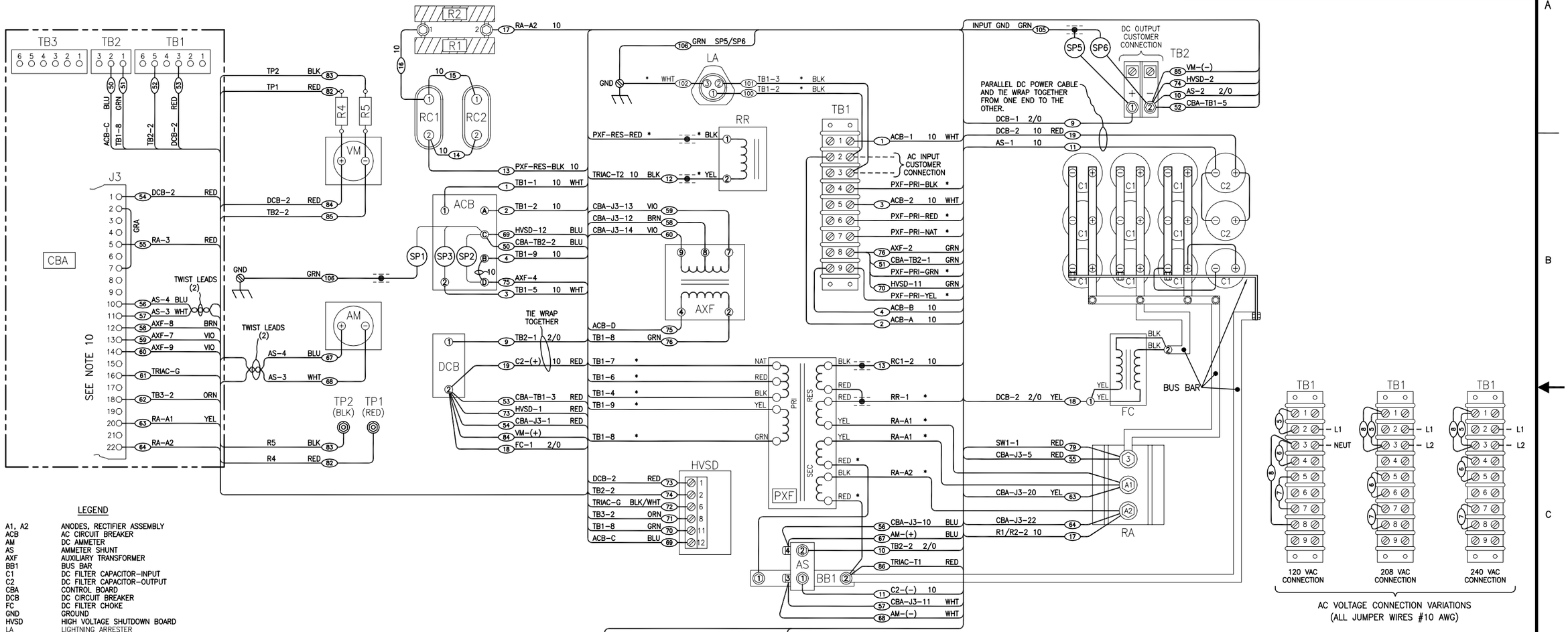
REVISIONS			
REVISION LEVEL	DESCRIPTION	REV. BY REV. DATE	APPROVED BY APPROVED DATE
2	SEE ECN 13433	JPR 04/23/01	MM 05/03/01



LEGEND

A1, A2	ANODES, RECTIFIER ASSEMBLY
ACB	AC CIRCUIT BREAKER
AM	DC AMMETER
AS	AMMETER SHUNT
AXF	AUXILIARY TRANSFORMER
BB1	BUS BAR
C1	DC FILTER CAPACITOR–INPUT
C2	DC FILTER CAPACITOR–OUTPUT
CBA	CONTROL BOARD
DCB	DC CIRCUIT BREAKER
FC	DC FILTER CHOKE
GND	GROUND
HVSD	HIGH VOLTAGE SHUTDOWN BOARD
LA	LIGHTNING ARRESTER
PRI	PRIMARY WINDING
PXF	POWER TRANSFORMER
R1, R2	RESONANT RESISTOR
R3, R4, R5	RESISTOR
RA	SILICON RECTIFIER ASSEMBLY
RC	RESONANT CAPACITOR
RES	RESONANT WINDING
RR	RESONANT REACTOR
SC	SNUBBER CAPACITOR
SEC	SECONDARY WINDING
SP1–3, 5, 6	SURGE PROTECTOR
SR	SNUBBER RESISTOR
SW1	DISCHARGE SWITCH
TB1	TERMINAL BLOCK–PXF TERMINATION
TB2	TERMINAL BLOCK–DC OUTPUT
TB3	TERMINAL BLOCK
TP1	POSITIVE OUTPUT TEST JACK
TP2	NEGATIVE OUTPUT TEST JACK
TRIAC	RESONANT CONTROL THYRISTOR
VM	DC VOLTMETER
	SPLICE

NOTES:

1. ALL WIRES ARE BLACK UNLESS OTHERWISE SPECIFIED.
2. ALL WIRES ARE #18 AWG STRANDED OR SELF LEADS UNLESS OTHERWISE SPECIFIED.
3. AC BREAKER TERMINAL LOCATIONS MAY BE DIFFERENT THAN SHOWN. TERMINAL IDENTIFIERS (A, B, C, D, 1, 2) WILL BE CORRECT.
4. ALL WIRES SPECIFIED WITH "*" ARE SELF LEADS.
5. TB1–2 IS LINE 1. TB1–3 IS LINE 2 FOR 208V & 240V. TB1–3 IS NEUTRAL FOR 120V.
6. CIRCUIT BREAKERS ARE SHOWN FROM FRONT OF CABINET.
7. WIRE NUMBERS USED:
   POWER: 1 THROUGH 19
   CONTROL: 50 THROUGH 64, 67 THROUGH 86, 105, 106
   LIGHTNING ARRESTER: 100, 101, 102
8. SP4 IS PART OF RECTIFIER (RA) ASSEMBLY.
10. J3 ON CBA IS MARKED OPPOSITE OF CONNECTOR MARKINGS. EXAMPLE: CBA–J3–2 IS CONNECTOR 21 AND CBA–J3–20 IS CONNECTOR 3.

DISTRIBUTION CODE:

APPROVALS	DATE
DRAWN G. D. HAWKINS	06/04/91
CHECKED D. B. WILSON	11/26/91
APPROVED D. H. MUHLRAD	11/27/91
APPROVED	

BLANK SIZE:

C&D TECHNOLOGIES, INC. Power Solutions

WIRING DIAGRAM HRT24AC200E NEGATIVE GROUND WITH ANALOG METER

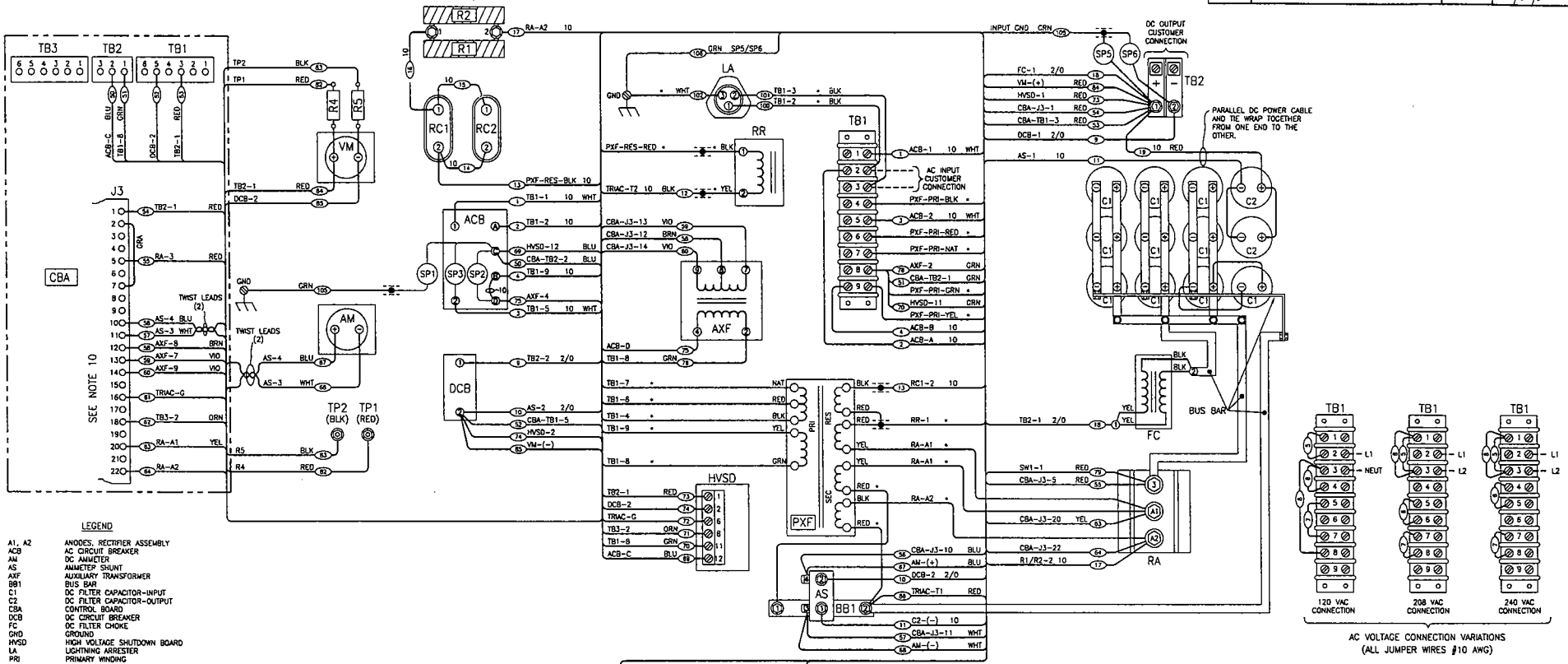
SIZE	RATING	DOC TYPE / NUMBER	REVISION
B	STANDARD	NBC–2379	2
SCALE: NONE	SHEET: 1 OF 1	FILE NAME: NBC2379_SHT_1_ISS_2	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES ± TOLERANCES ON:

FRACTIONS	DECIMALS XX	DECIMALS XXX	ANGLES
±1/32	0.020	0.010	±1°

REVISIONS

REVISION LEVEL	DESCRIPTION	REV. BY REV. DATE	APPROVED BY APPROVED DATE
1	SEE ECN 12520	KEL 09/13/99	MM 9/28/99



LEGEND

A1, A2	ANODES, RECTIFIER ASSEMBLY
ACB	AC CIRCUIT BREAKER
AM	DC AMMETER
AS	AMMETER SHUNT
AXF	AUXILIARY TRANSFORMER
BB1	BUS BAR
C1	DC FILTER CAPACITOR-INPUT
C2	DC FILTER CAPACITOR-OUTPUT
CBA	CONTROL BOARD
DCB	DC CIRCUIT BREAKER
FC	DC FILTER CHOKE
GND	GROUND
HVSD	HIGH VOLTAGE SHUTDOWN BOARD
LA	LIGHTNING ARRESTER
PRI	PRIMARY WINDING
PXF	POWER TRANSFORMER
R1, R2	RESONANT RESISTOR
R3, R4, R5	RESISTOR
RA	SILICON RECTIFIER ASSEMBLY
RC	RESONANT CAPACITOR
RES	RESONANT WINDING
RR	RESONANT REACTOR
SC	SNUBBER CAPACITOR
SEC	SECONDARY WINDING
SP1-3, 5, 6	SURGE PROTECTOR
SR	SNUBBER RESISTOR
SW1	DISCHARGE SWITCH
TB1	TERMINAL BLOCK-PXF TERMINATION
TB2	TERMINAL BLOCK-DC OUTPUT
TB3	TERMINAL BLOCK
TP1	POSITIVE OUTPUT TEST JACK
TP2	NEGATIVE OUTPUT TEST JACK
TRAC	RESONANT CONTROL THYRISTOR
VM	DC VOLTMETER
	SPLICE

NOTES:

1. ALL WIRES ARE BLACK UNLESS OTHERWISE SPECIFIED.
2. ALL WIRES ARE #18 AWG STRANDED OR SELF LEADS UNLESS OTHERWISE SPECIFIED.
3. AC BREAKER TERMINAL LOCATIONS MAY BE DIFFERENT THAN SHOWN. TERMINAL IDENTIFIERS (A, B, C, D, 1, 2) WILL BE CORRECT.
4. ALL WIRES SPECIFIED WITH "-" ARE SELF LEADS.
5. TB1-2 IS LINE 1. TB1-3 IS LINE 2 FOR 208V & 240V. TB1-3 IS NEUTRAL FOR 120V.
6. CIRCUIT BREAKERS ARE SHOWN FROM FRONT OF CABINET.
7. WIRE NUMBERS USED:
   POWER: 1 THROUGH 19
   CONTROL: 50 THROUGH 64, 67 THROUGH 86, 105, 108
   LIGHTNING ARRESTER: 100, 101, 102
8. SP4 IS PART OF RECTIFIER (RA) ASSEMBLY.
10. J3 ON CBA IS MARKED OPPOSITE OF CONNECTOR MARKINGS. EXAMPLE: CBA-J3-2 IS CONNECTOR 21 AND CBA-J3-2D IS CONNECTOR 3.

DISTRIBUTION CODE:

APPROVALS	DATE
DRAWN G. D. HAWKINS	06/03/91
CHECKED D. B. WILSON	11/26/91
APPROVED D. H. MUHLRAD	11/27/91
APPROVED	
BLANK SIZE:	

C&D TECHNOLOGIES, INC.
Power Solutions

WIRING DIAGRAM HRT24AC200E POSITIVE GROUND WITH ANALOG METER

SIZE	RATING	DOC TYPE / NUMBER	REVISION
B	STANDARD	NBC-2380	1

SCALE: NONE | SHEET: 1 OF 1 | FILE NAME: NBC2380_SHT_1_ISS_1

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES ± TOLERANCES ON:

FRACTIONS	DECIMALS XX	DECIMALS XXX	ANGLES
±1/32	0.020	0.010	±1°

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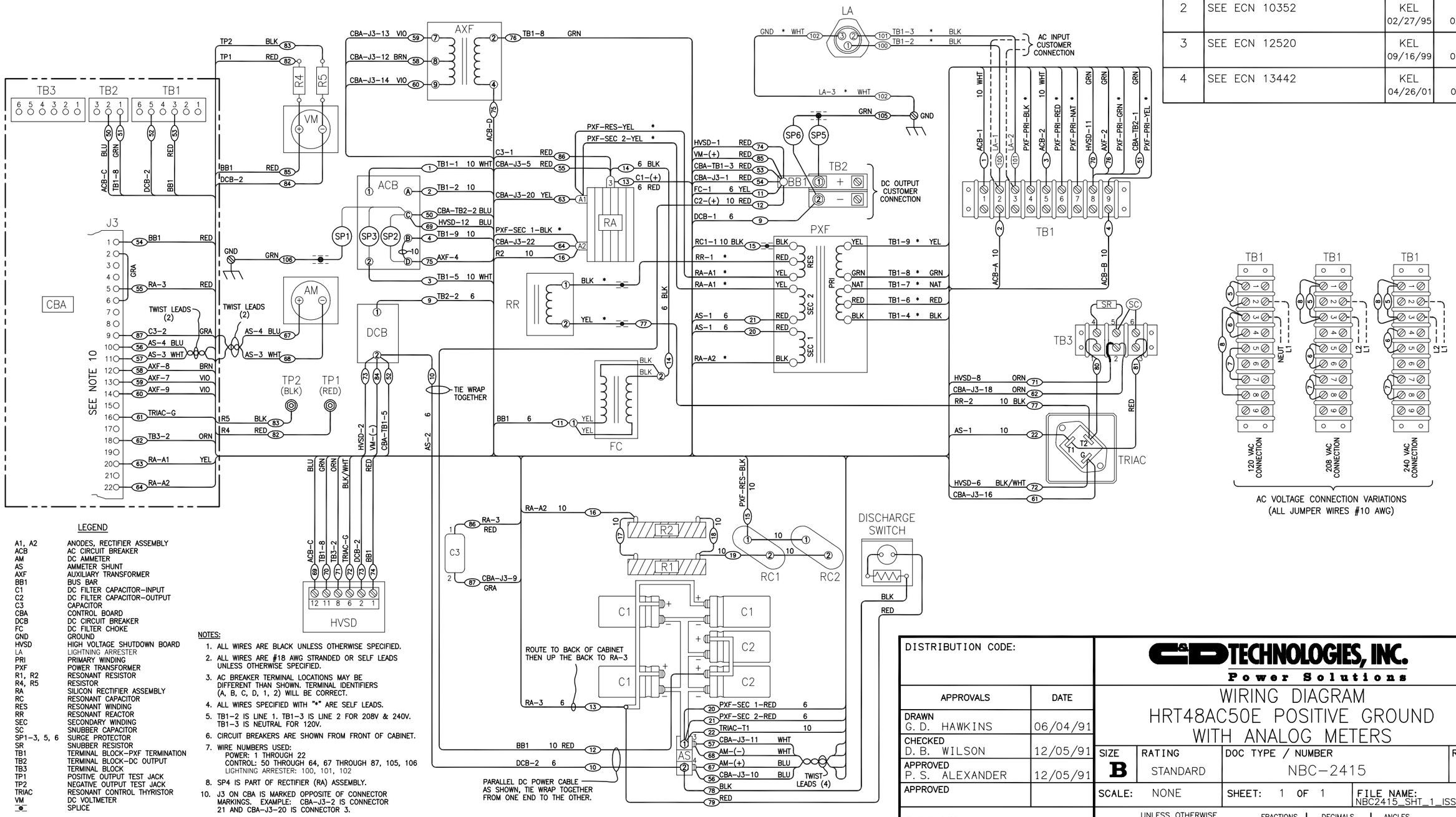
REVISIONS			
REVISION LEVEL	DESCRIPTION	REV. BY REV. DATE	APPROVED BY APPROVED DATE
1	SEE ECN 9465		DBW 05/12/92
2	SEE ECN 10352	KEL 02/27/95	MCM 02/27/95
3	SEE ECN 12520	KEL 09/16/99	MCM 09/18/99
4	SEE ECN 13442	KEL 04/26/01	MM 04/26/01



LEGEND

A1, A2	ANODES, RECTIFIER ASSEMBLY
ACB	AC CIRCUIT BREAKER
AM	DC AMMETER
AS	AMMETER SHUNT
AXF	AUXILIARY TRANSFORMER
BB1	BUS BAR
C1	DC FILTER CAPACITOR–INPUT
C2	DC FILTER CAPACITOR–OUTPUT
C3	CAPACITOR
CBA	CONTROL BOARD
DCB	DC CIRCUIT BREAKER
FC	DC FILTER CHOKE
GND	GROUND
HVSD	HIGH VOLTAGE SHUTDOWN BOARD
LA	LIGHTNING ARRESTER
PRI	PRIMARY WINDING
PXF	POWER TRANSFORMER
R1, R2	RESONANT RESISTOR
R4, R5	RESISTOR
RA	SILICON RECTIFIER ASSEMBLY
RC	RESONANT CAPACITOR
RES	RESONANT WINDING
RR	RESONANT REACTOR
SEC	SECONDARY WINDING
SC	SNUBBER CAPACITOR
SP1–3, 5, 6	SURGE PROTECTOR
SR	SNUBBER RESISTOR
TB1	TERMINAL BLOCK–PXF TERMINATION
TB2	TERMINAL BLOCK–DC OUTPUT
TB3	TERMINAL BLOCK
TP1	POSITIVE OUTPUT TEST JACK
TP2	NEGATIVE OUTPUT TEST JACK
TRIAC	RESONANT CONTROL THYRISTOR
VM	DC VOLTMETER
	SPLICE

NOTES:

1. ALL WIRES ARE BLACK UNLESS OTHERWISE SPECIFIED.
2. ALL WIRES ARE #18 AWG STRANDED OR SELF LEADS UNLESS OTHERWISE SPECIFIED.
3. AC BREAKER TERMINAL LOCATIONS MAY BE DIFFERENT THAN SHOWN. TERMINAL IDENTIFIERS (A, B, C, D, 1, 2) WILL BE CORRECT.
4. ALL WIRES SPECIFIED WITH "*" ARE SELF LEADS.
5. TB1–2 IS LINE 1. TB1–3 IS LINE 2 FOR 208V & 240V. TB1–3 IS NEUTRAL FOR 120V.
6. CIRCUIT BREAKERS ARE SHOWN FROM FRONT OF CABINET.
7. WIRE NUMBERS USED:
   POWER: 1 THROUGH 22
   CONTROL: 50 THROUGH 64, 67 THROUGH 87, 105, 106
   LIGHTNING ARRESTER: 100, 101, 102
8. SP4 IS PART OF RECTIFIER (RA) ASSEMBLY.
10. J3 ON CBA IS MARKED OPPOSITE OF CONNECTOR MARKINGS. EXAMPLE: CBA–J3–2 IS CONNECTOR 21 AND CBA–J3–20 IS CONNECTOR 3.

DISTRIBUTION CODE:

APPROVALS	DATE
DRAWN G. D. HAWKINS	06/04/91
CHECKED D. B. WILSON	12/05/91
APPROVED P. S. ALEXANDER	12/05/91
APPROVED	

BLANK SIZE:

C&D TECHNOLOGIES, INC.
Power Solutions

WIRING DIAGRAM
HRT48AC50E POSITIVE GROUND
WITH ANALOG METERS

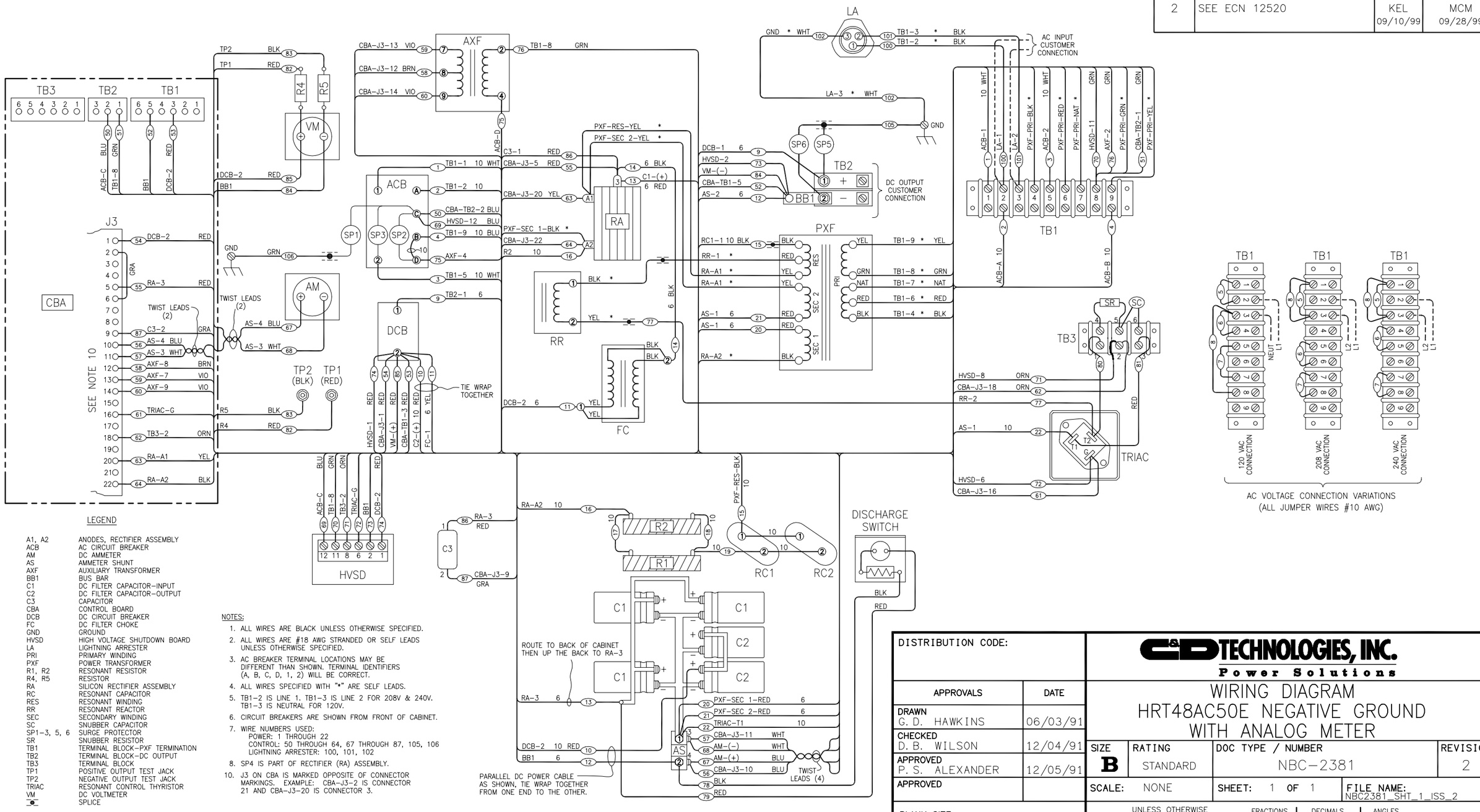
SIZE	RATING	DOC TYPE / NUMBER	REVISION
B	STANDARD	NBC–2415	4

SCALE: NONE SHEET: 1 OF 1 FILE NAME: NBC2415_SHT_1_ISS_4

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
± TOLERANCES ON:

FRACTIONS	DECIMALS XX	DECIMALS XXX	ANGLES
±1/32	0.020	0.010	±1°

REVISIONS			
REVISION LEVEL	DESCRIPTION	REV. BY REV. DATE	APPROVED BY APPROVED DATE
1	SEE ECN 10352	KEL 02/27/95	MCM 02/27/95
2	SEE ECN 12520	KEL 09/10/99	MCM 09/28/99



LEGEND

A1, A2	ANODES, RECTIFIER ASSEMBLY
ACB	AC CIRCUIT BREAKER
AM	DC AMMETER
AS	AMMETER SHUNT
AXF	AUXILIARY TRANSFORMER
BB1	BUS BAR
C1	DC FILTER CAPACITOR–INPUT
C2	DC FILTER CAPACITOR–OUTPUT
C3	CAPACITOR
CBA	CONTROL BOARD
DCB	DC CIRCUIT BREAKER
FC	DC FILTER CHOKE
GND	GROUND
HVSD	HIGH VOLTAGE SHUTDOWN BOARD
LA	LIGHTNING ARRESTER
PRI	PRIMARY WINDING
PXF	POWER TRANSFORMER
R1, R2	RESONANT RESISTOR
R4, R5	RESISTOR
RA	SILICON RECTIFIER ASSEMBLY
RC	RESONANT CAPACITOR
RES	RESONANT WINDING
RR	RESONANT REACTOR
SEC	SECONDARY WINDING
SC	SNUBBER CAPACITOR
SP1–3, 5, 6	SURGE PROTECTOR
SR	SNUBBER RESISTOR
TB1	TERMINAL BLOCK–PXF TERMINATION
TB2	TERMINAL BLOCK–DC OUTPUT
TB3	TERMINAL BLOCK
TP1	POSITIVE OUTPUT TEST JACK
TP2	NEGATIVE OUTPUT TEST JACK
TRIAC	RESONANT CONTROL THYRISTOR
VM	DC VOLTMETER
⊙	SPLICE

NOTES:

1. ALL WIRES ARE BLACK UNLESS OTHERWISE SPECIFIED.
2. ALL WIRES ARE #18 AWG STRANDED OR SELF LEADS UNLESS OTHERWISE SPECIFIED.
3. AC BREAKER TERMINAL LOCATIONS MAY BE DIFFERENT THAN SHOWN. TERMINAL IDENTIFIERS (A, B, C, D, 1, 2) WILL BE CORRECT.
4. ALL WIRES SPECIFIED WITH "*" ARE SELF LEADS.
5. TB1–2 IS LINE 1. TB1–3 IS LINE 2 FOR 208V & 240V. TB1–3 IS NEUTRAL FOR 120V.
6. CIRCUIT BREAKERS ARE SHOWN FROM FRONT OF CABINET.
7. WIRE NUMBERS USED:
   POWER: 1 THROUGH 22
   CONTROL: 50 THROUGH 64, 67 THROUGH 87, 105, 106
   LIGHTNING ARRESTER: 100, 101, 102
8. SP4 IS PART OF RECTIFIER (RA) ASSEMBLY.
10. J3 ON CBA IS MARKED OPPOSITE OF CONNECTOR MARKINGS. EXAMPLE: CBA–J3–2 IS CONNECTOR 21 AND CBA–J3–20 IS CONNECTOR 3.

DISTRIBUTION CODE:

APPROVALS	DATE
DRAWN G. D. HAWKINS	06/03/91
CHECKED D. B. WILSON	12/04/91
APPROVED P. S. ALEXANDER	12/05/91
APPROVED	

BLANK SIZE:

C&D TECHNOLOGIES, INC. Power Solutions

WIRING DIAGRAM HRT48AC50E NEGATIVE GROUND WITH ANALOG METER

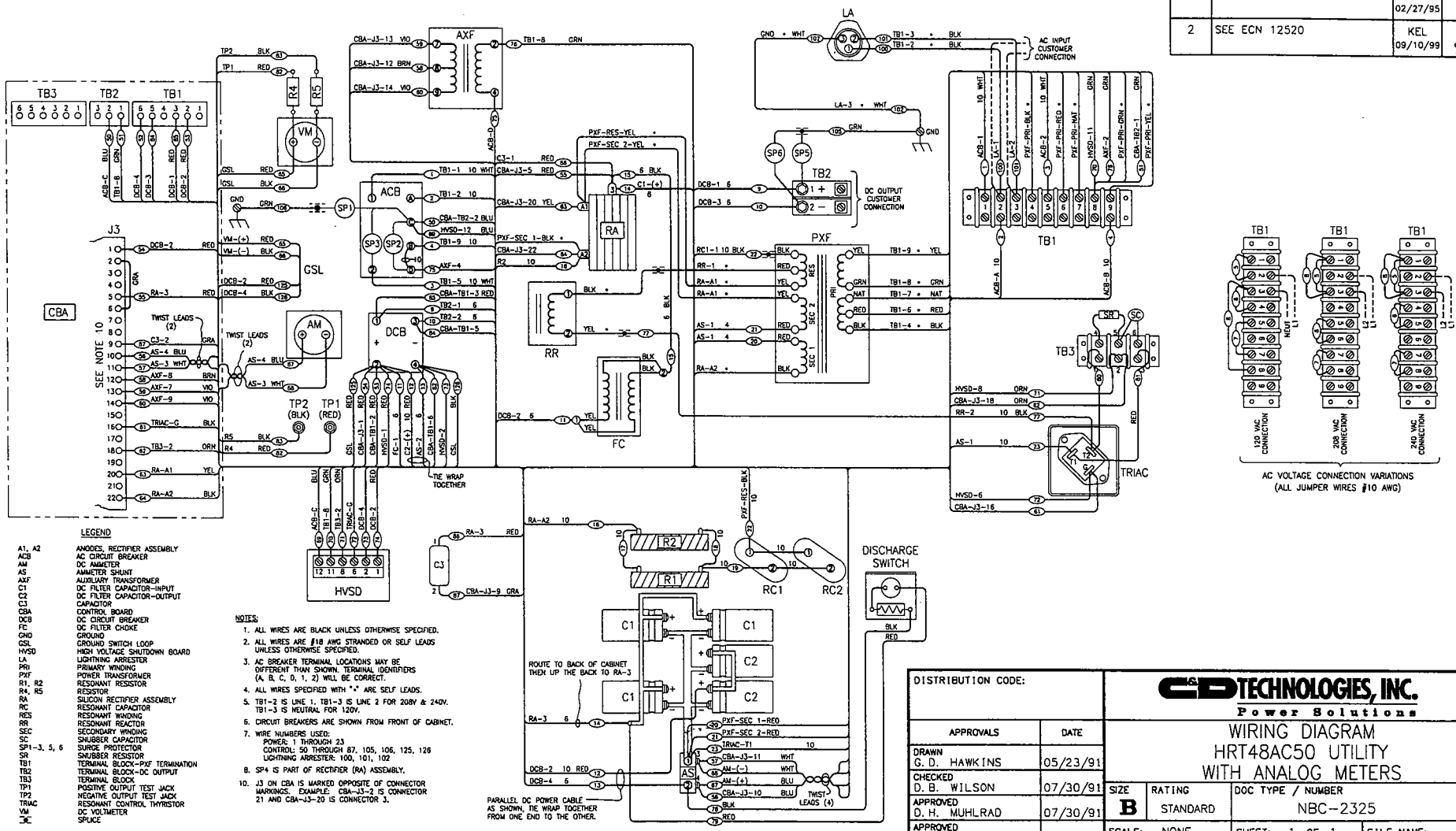
SIZE	RATING	DOC TYPE / NUMBER	REVISION
B	STANDARD	NBC–2381	2

SCALE: NONE SHEET: 1 OF 1 FILE NAME: NBC2381_SHT_1_ISS_2

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES ± TOLERANCES ON:

FRACTIONS	DECIMALS XX	DECIMALS XXX	ANGLES
±1/32	0.020	0.010	±1°

REVISIONS			
REVISION LEVEL	DESCRIPTION	REV. BY REV. DATE	APPROVED BY APPROVED DATE
1	SEE ECN 10352	KEL 02/27/95	MCM 02/27/95
2	SEE ECN 12520	KEL 09/10/99	mm 9/28/99



LEGEND

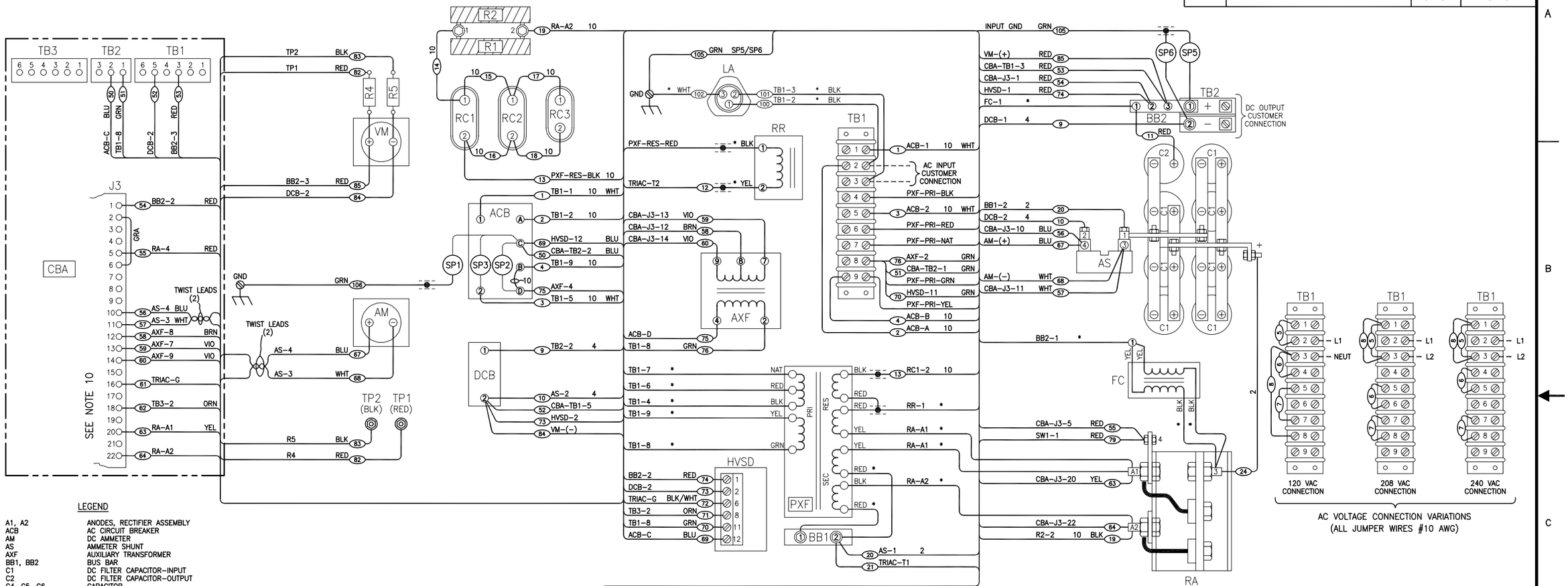
A1, A2	ANODES, RECTIFIER ASSEMBLY
ACB	AC CIRCUIT BREAKER
AM	DC AMMETER
AS	AMMETER SHUNT
AXF	AUXILIARY TRANSFORMER
C1	DC FILTER CAPACITOR-INPUT
C2	DC FILTER CAPACITOR-OUTPUT
C3	CAPACITOR
CBA	CONTROL BOARD
DCB	DC CIRCUIT BREAKER
FC	DC FILTER CHOKE
GND	GROUND
GSL	GROUND SWITCH LOOP
HVSD	HIGH VOLTAGE SHUTDOWN BOARD
LA	LIGHTNING ARRESTER
PRI	PRIMARY WINDING
PXF	POWER TRANSFORMER
R1, R2	RESONANT RESISTOR
R4, R5	RESISTOR
RA	SILICON RECTIFIER ASSEMBLY
RC	RESONANT CAPACITOR
RES	RESONANT WINDING
RR	RESONANT REACTOR
SEC	SECONDARY WINDING
SC	SNUBBER CAPACITOR
SP1-3, 5, 6	SURGE PROTECTOR
SR	SNUBBER RESISTOR
TB1	TERMINAL BLOCK-PXF TERMINATION
TB2	TERMINAL BLOCK-DC OUTPUT
TB3	TERMINAL BLOCK
TP1	POSITIVE OUTPUT TEST JACK
TP2	NEGATIVE OUTPUT TEST JACK
TRIAC	RESONANT CONTROL THYRISTOR
VM	DC VOLTMETER
JC	SPLICE

NOTES:

1. ALL WIRES ARE BLACK UNLESS OTHERWISE SPECIFIED.
2. ALL WIRES ARE #18 AWG STRANDED OR SELF LEADS UNLESS OTHERWISE SPECIFIED.
3. AC BREAKER TERMINAL LOCATIONS MAY BE DIFFERENT THAN SHOWN. TERMINAL IDENTIFIERS (A, B, C, D, 1, 2) WILL BE CORRECT.
4. ALL WIRES SPECIFIED WITH "*" ARE SELF LEADS.
5. TB1-2 IS LINE 1, TB1-3 IS LINE 2 FOR 208V & 240V. TB1-3 IS NEUTRAL FOR 120V.
6. CIRCUIT BREAKERS ARE SHOWN FROM FRONT OF CABINET.
7. WIRE NUMBERS USED:
   POWER: 1 THROUGH 23
   CONTROL: 50 THROUGH 87, 105, 106, 125, 126
   LIGHTNING ARRESTER: 100, 101, 102
8. SP4 IS PART OF RECTIFIER (RA) ASSEMBLY.
10. J3 ON CBA IS MARKED OPPOSITE OF CONNECTOR MARKINGS. EXAMPLE: CBA-J3-2 IS CONNECTOR 21 AND CBA-J3-20 IS CONNECTOR 3.

DISTRIBUTION CODE:		C&D TECHNOLOGIES, INC. Power Solutions	
APPROVALS	DATE	WIRING DIAGRAM HRT48AC50 UTILITY WITH ANALOG METERS	
DRAWN G. D. HAWKINS	05/23/91		
CHECKED D. B. WILSON	07/30/91	SIZE B / RATING STANDARD	DOC TYPE / NUMBER NBC-2325 / REVISION 2
APPROVED D. H. MUHLRAD	07/30/91	SCALE: NONE	SHEET: 1 OF 1 / FILE NAME: NBC2325_SHT_1_ISS_2
APPROVED		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES ± TOLERANCES ON:	FRACTIONS ±1/32 / DECIMALS XX ±0.020, XXX ±0.010 / ANGLES ±1°
BLANK SIZE:			

REVISIONS			
REVISION LEVEL	DESCRIPTION	REV. BY REV. DATE	APPROVED BY APPROVED DATE
2	SEE ECN 13436	JPR 04/23/01	MM 05/01/01



LEGEND

A1, A2	ANODES, RECTIFIER ASSEMBLY
ACB	AC CIRCUIT BREAKER
AM	DC AMMETER
AS	AMMETER SHUNT
AXF	AUXILIARY TRANSFORMER
BB1, BB2	BUS BAR
C1	DC FILTER CAPACITOR–INPUT
C2	DC FILTER CAPACITOR–OUTPUT
C4, C5, C6	CAPACITOR
CBA	CONTROL BOARD
DCB	DC CIRCUIT BREAKER
FC	DC FILTER CHOKE
GND	GROUND
HVSD	HIGH VOLTAGE SHUTDOWN BOARD
LA	LIGHTNING ARRESTER
PRI	PRIMARY WINDING
PXF	POWER TRANSFORMER
R1, R2	RESONANT RESISTOR
R3, R4, R5	RESISTOR
RA	SILICON RECTIFIER ASSEMBLY
RC	RESONANT CAPACITOR
RES	RESONANT WINDING
RR	RESONANT REACTOR
SC	SNUBBER CAPACITOR
SEC	SECONDARY WINDING
SP1–SP3, SP5, SP6	SURGE PROTECTOR
SR	SNUBBER RESISTOR
SW1	DISCHARGE SWITCH
TB1	TERMINAL BLOCK–PXF TERMINATION
TB2	TERMINAL BLOCK–DC OUTPUT
TB3	TERMINAL BLOCK
TP1	POSITIVE OUTPUT TEST JACK
TP2	NEGATIVE OUTPUT TEST JACK
TRIAC	RESONANT CONTROL THYRISTOR
VM	DC VOLTMETER
	SPLICE

NOTES:

1. ALL WIRES ARE BLACK UNLESS OTHERWISE SPECIFIED.
2. ALL WIRES ARE #18 AWG STRANDED OR SELF LEADS UNLESS OTHERWISE SPECIFIED.
3. AC BREAKER TERMINAL LOCATIONS MAY BE DIFFERENT THAN SHOWN. TERMINAL IDENTIFIERS (A, B, C, D, 1, 2) WILL BE CORRECT.
4. ALL WIRES SPECIFIED WITH "*" ARE SELF LEADS.
5. TB1–2 IS LINE 1. TB1–3 IS LINE 2 FOR 208V & 240V. TB1–3 IS NEUTRAL FOR 120V.
6. CIRCUIT BREAKERS ARE SHOWN FROM FRONT OF CABINET.
7. WIRE NUMBERS USED:
   POWER: 1 THROUGH 21
   CONTROL: 50 THROUGH 64, 67 THROUGH 85, 105, 106
   LIGHTNING ARRESTER: 100, 101, 102
8. SP4 IS PART OF RECTIFIER (RA) ASSEMBLY.
10. J3 ON CBA IS MARKED OPPOSITE OF CONNECTOR MARKINGS. EXAMPLE: CBA–J3–2 IS CONNECTOR 21 AND CBA–J3–20 IS CONNECTOR 3.

DISTRIBUTION CODE:

APPROVALS	DATE
DRAWN G. D. HAWKINS	06/03/91
CHECKED D. B. WILSON	11/06/91
APPROVED D. H. MUHLRAD	11/07/91
APPROVED	

BLANK SIZE:

C&D TECHNOLOGIES, INC. Power Solutions

WIRING DIAGRAM HRT48AC100E POSITIVE GROUND WITH ANALOG METERS

SIZE	RATING	DOC TYPE / NUMBER	REVISION
B	STANDARD	NBC–2391	2

SCALE: NONE SHEET: 1 OF 1 FILE NAME: NBC2391_SHT_1_ISS_2

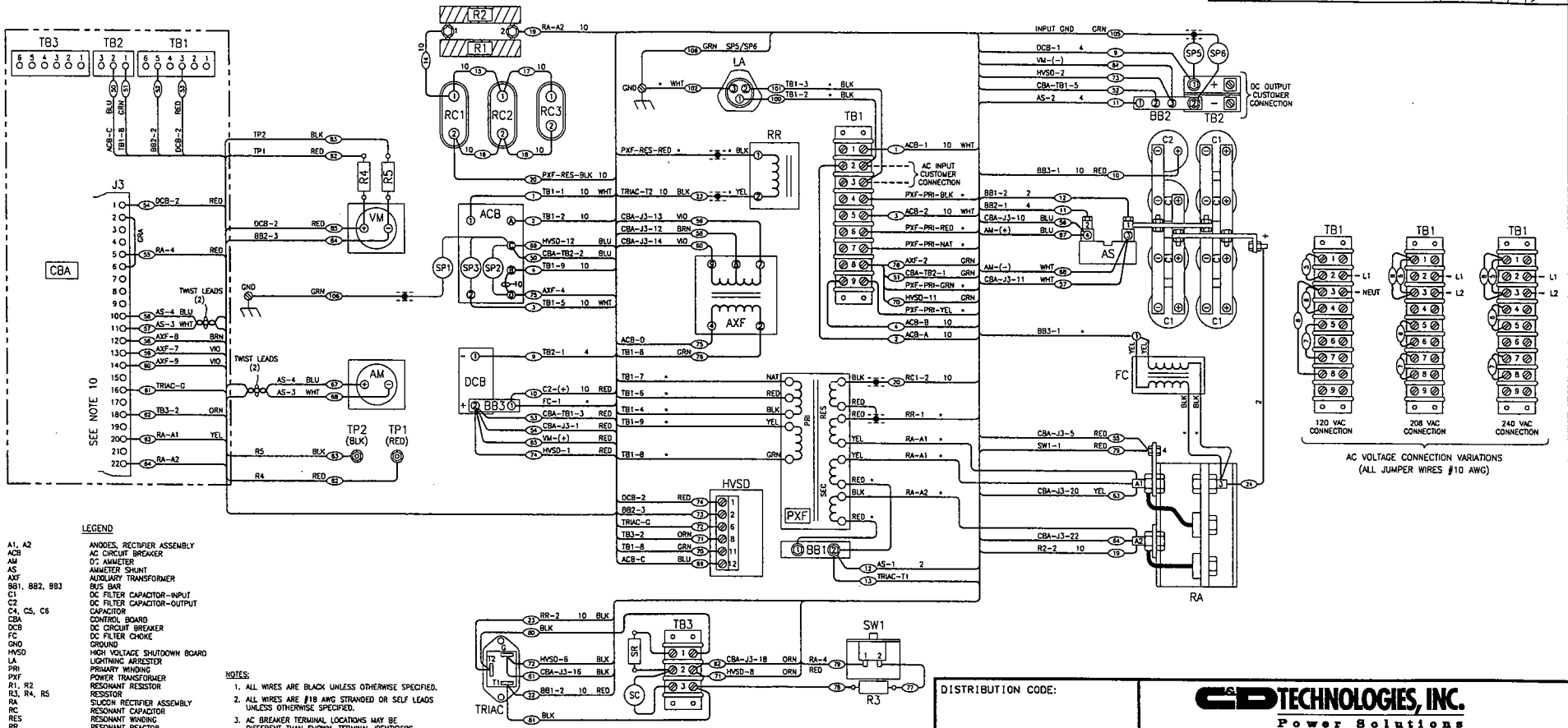
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES ± TOLERANCES ON:

FRACTIONS	DECIMALS		ANGLES
	XX	XXX	
±1/32	0.020	0.010	±1°

OBSOLETE - FOR RECORD ONLY

REVISIONS

REVISION LEVEL	DESCRIPTION	REV. BY REV. DATE	APPROVED BY APPROVED DATE
1	SEE ECN 12520	KEL 09/13/99	9/28/99



LEGEND

A1, A2	ANODES, RECTIFIER ASSEMBLY
ACB	AC CIRCUIT BREAKER
AM	DC AMMETER
AS	AMMETER SHUNT
AXF	AUXILIARY TRANSFORMER
BB1, BB2, BB3	BUS BAR
C1	DC FILTER CAPACITOR-INPUT
C2	DC FILTER CAPACITOR-OUTPUT
C4, C5, C6	CAPACITOR
CBA	CONTROL BOARD
DCB	DC CIRCUIT BREAKER
FC	DC FILTER CHOKE
GND	GROUND
HVSD	HIGH VOLTAGE SHUTDOWN BOARD
LA	LIGHTNING ARRESTER
PRI	PRIMARY WINDING
PXF	POWER TRANSFORMER
R1, R2	RESONANT RESISTOR
R3, R4, R5	RESISTOR
RA	SILICON RECTIFIER ASSEMBLY
RC	RESONANT CAPACITOR
RES	RESONANT WINDING
RR	RESONANT REACTOR
SC	SNUBBER CAPACITOR
SEC	SECONDARY WINDING
SP1-SP3, SP5, SP6	SURGE PROTECTOR
SR	SNUBBER RESISTOR
SW1	DISCHARGE SWITCH
TB1	TERMINAL BLOCK-PXF TERMINATION
TB2	TERMINAL BLOCK-DC OUTPUT
TB3	TERMINAL BLOCK
TP1	POSITIVE OUTPUT TEST JACK
TP2	NEGATIVE OUTPUT TEST JACK
TRIAC	RESONANT CONTROL THYRISTOR
VM	DC VOLTMETER
	SPLICE

NOTES:

1. ALL WIRES ARE BLACK UNLESS OTHERWISE SPECIFIED.
2. ALL WIRES ARE #18 AWG STRANDED OR SELF LEADS UNLESS OTHERWISE SPECIFIED.
3. AC BREAKER TERMINAL LOCATIONS MAY BE DIFFERENT THAN SHOWN. TERMINAL IDENTIFIERS (A, B, C, D, 1, 2) WILL BE CORRECT.
4. ALL WIRES SPECIFIED WITH "-" ARE SELF LEADS.
5. TB1-2 IS LINE 1. TB1-3 IS LINE 2 FOR 208V & 240V. TB1-3 IS NEUTRAL FOR 120V.
6. CIRCUIT BREAKERS ARE SHOWN FROM FRONT OF CABINET.
7. WIRE NUMBERS USED:
   POWER: 1 THROUGH 20
   CONTROL: 50 THROUGH 64, 67 THROUGH 85, 105, 106
   LIGHTNING ARRESTER: 100, 101, 102
8. SP4 IS PART OF RECTIFIER (RA) ASSEMBLY.
10. J3 ON CBA IS MARKED OPPOSITE OF CONNECTOR MARKINGS. EXAMPLE: CBA-J3-2 IS CONNECTOR 21 AND CBA-J3-20 IS CONNECTOR 3.

DISTRIBUTION CODE:

APPROVALS	DATE
DRAWN G. D. HAWKINS	05/31/90
CHECKED D. B. WILSON	11/06/91
APPROVED D. H. MUHLRAD	11/07/91
APPROVED	

BLANK SIZE:

C&D TECHNOLOGIES, INC.
Power Solutions

WIRING DIAGRAM
HRT48AC100E NEGATIVE GROUND WITH ANALOG METER

SIZE	RATING	DOC TYPE / NUMBER	REVISION
B	STANDARD	NBC-2378	1

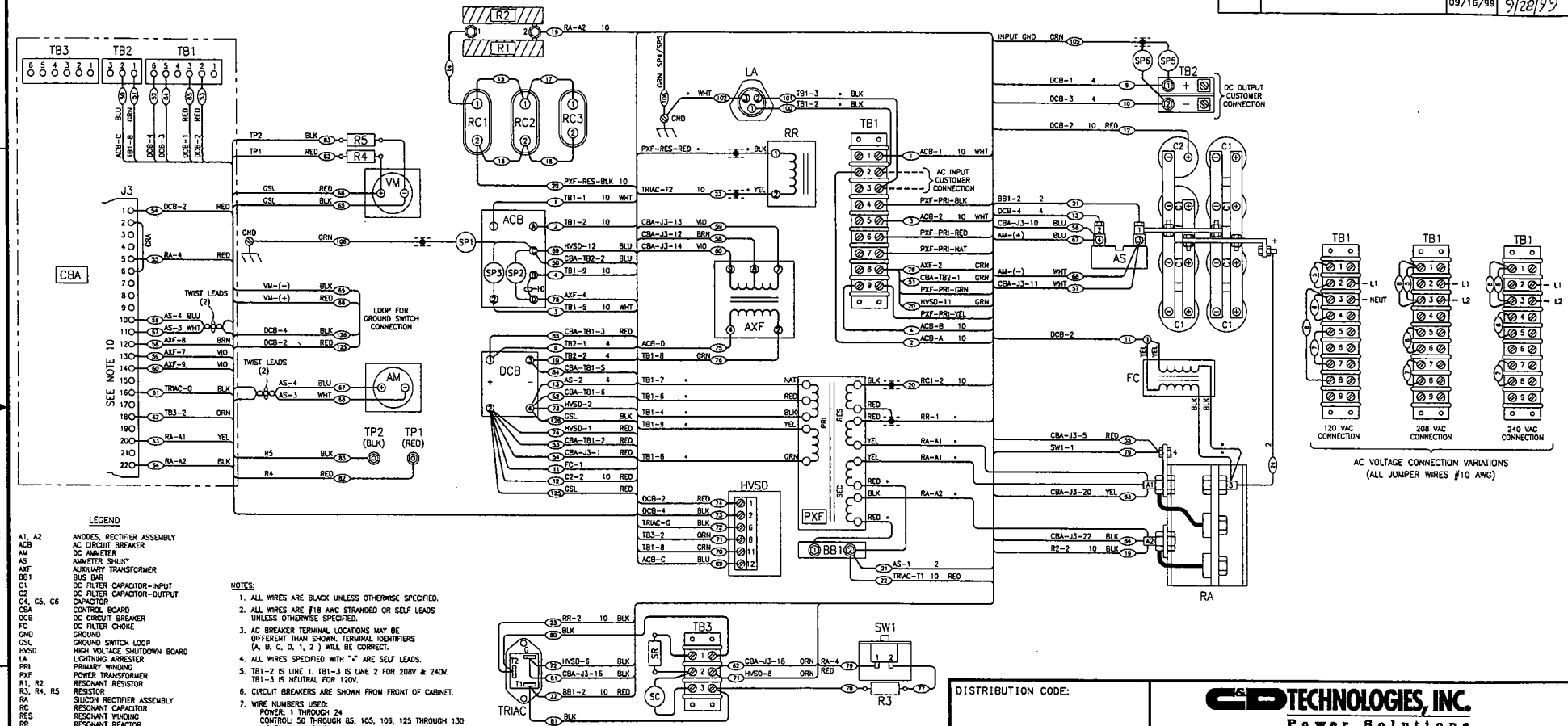
SCALE: NONE | SHEET: 1 OF 1 | FILE NAME: NBC2378_SHT_1_ISS_1

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
± TOLERANCES ON: FRACTIONS ±1/32 | DECIMALS XX ±0.020, XXX ±0.010 | ANGLES ±1°

OBSOLETE - FOR RECORD ONLY

REVISIONS

REVISION LEVEL	DESCRIPTION	REV. BY REV. DATE	APPROVED BY APPROVED DATE
1	SEE ECN 12520	KEL 09/16/99	MM 9/28/99



LEGEND

A1, A2	ANODES, RECTIFIER ASSEMBLY
ACB	AC CIRCUIT BREAKER
AM	DC AMMETER
AS	AMMETER SHUNT
AXF	AUXILIARY TRANSFORMER
BB1	BUS BAR
C1	DC FILTER CAPACITOR-INPUT
C2	DC FILTER CAPACITOR-OUTPUT
C4, C5, C6	CAPACITOR
CBA	CONTROL BOARD
DCB	DC CIRCUIT BREAKER
FC	DC FILTER CHOKE
GND	GROUND
GSL	GROUND SWITCH LOOP
HVSD	HIGH VOLTAGE SHUTDOWN BOARD
LA	LIGHTNING ARRESTER
PRI	PRIMARY WINDING
PXF	POWER TRANSFORMER
R1, R2	RESONANT RESISTOR
R3, R4, R5	RESISTOR
RA	SILICON RECTIFIER ASSEMBLY
RC	RESONANT CAPACITOR
RES	RESONANT WINDING
RR	RESONANT REACTOR
SC	SNUBBER CAPACITOR
SEC	SECONDARY WINDING
SP1-3, 5, 6	SURGE PROTECTOR
SR	SNUBBER RESISTOR
SW1	DISCHARGE SWITCH
TB1	TERMINAL BLOCK-PXF TERMINATION
TB2	TERMINAL BLOCK-DC OUTPUT
TB3	TERMINAL BLOCK
TP1	POSITIVE OUTPUT TEST JACK
TP2	NEGATIVE OUTPUT TEST JACK
TRIAC	RESONANT CONTROL THYRISTOR
VM	DC VOLTMETER
	SPLICE

NOTES:

1. ALL WIRES ARE BLACK UNLESS OTHERWISE SPECIFIED.
2. ALL WIRES ARE #18 AWG STRANDED OR SELF LEADS UNLESS OTHERWISE SPECIFIED.
3. AC BREAKER TERMINAL LOCATIONS MAY BE DIFFERENT THAN SHOWN. TERMINAL IDENTIFIERS (A, B, C, D, 1, 2) WILL BE CORRECT.
4. ALL WIRES SPECIFIED WITH "-" ARE SELF LEADS.
5. TB1-2 IS LINE 1. TB1-3 IS LINE 2 FOR 208V & 240V. TB1-3 IS NEUTRAL FOR 120V.
6. CIRCUIT BREAKERS ARE SHOWN FROM FRONT OF CABINET.
7. WIRE NUMBERS USED:
   POWER: 1 THROUGH 24
   CONTROL: 50 THROUGH 85, 105, 106, 125 THROUGH 130
   LIGHTNING ARRESTER: 100, 101, 102
8. SP4 IS PART OF RECTIFIER (RA) ASSEMBLY.
10. J3 ON CBA IS MARKED OPPOSITE OF CONNECTOR MARKINGS. EXAMPLE: CBA-J3-2 IS CONNECTOR 21 AND CBA-J3-20 IS CONNECTOR 3.

DISTRIBUTION CODE:

APPROVALS	DATE
DRAWN G. D. HAWKINS	05/02/91
CHECKED D. B. WILSON	10/31/91
APPROVED D. H. MUHLRAD	10/31/91
APPROVED	

BLANK SIZE:

C&D TECHNOLOGIES, INC.
Power Solutions

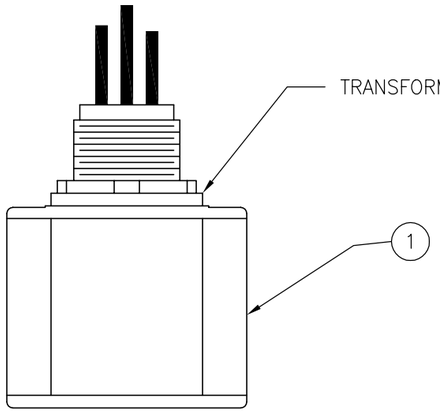
WIRING DIAGRAM HRT48AC100 UTILITY WITH ANALOG METERS

SIZE	RATING	DOC TYPE / NUMBER	REVISION
B	STANDARD	NBC-2326	1

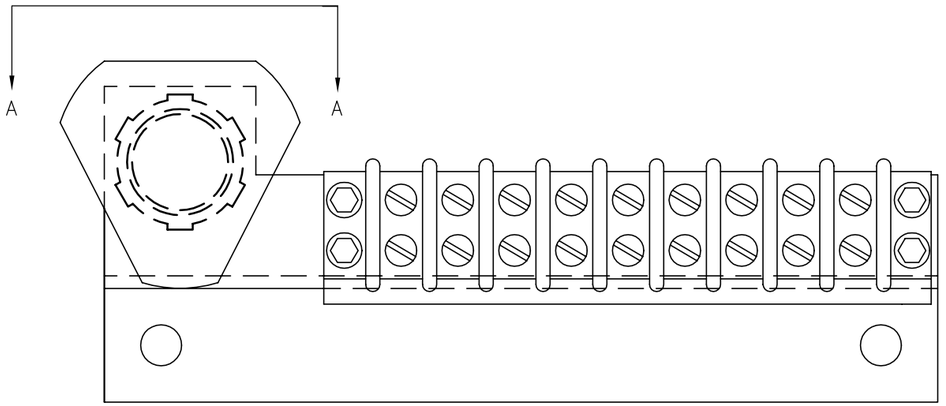
SCALE: NONE | SHEET: 1 OF 1 | FILE NAME: NBC2326_SHT_1_ISS_1

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES ± TOLERANCES ON:

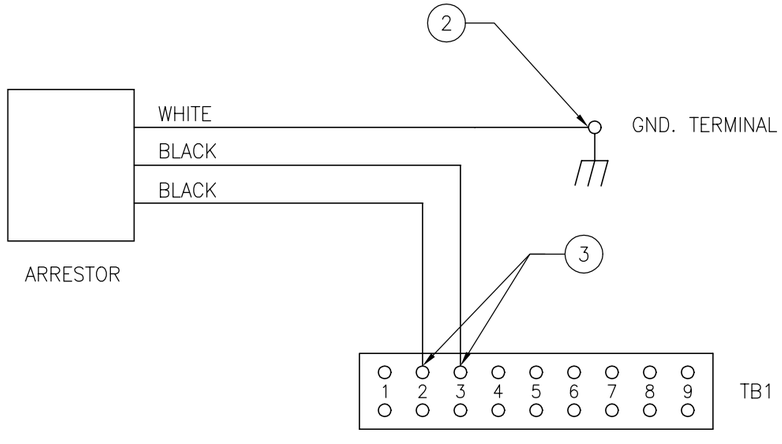
FRACTIONS	DECIMALS XX	DECIMALS XXX	ANGLES
±1/32	0.020	0.010	±1°



VIEW A – A



MOUNTING DETAIL



CONNECTION DIAGRAM

ITEM	DESCRIPTION
3	LUG
2	LUG
1	LIGHTNING ARRESTOR

ISSUES

ISSUE #	DESCRIPTION	ISS. BY ISS. DATE	APP. BY APP. DATE
0	ORIGINAL RELEASE	R. B. W. 6/21/90	D. H. M. 6/22/90

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES ± TOLERANCES ON:		APPROVALS	DATE
HOLES	+0. 004 −0. 002	DRAWN R. B. WEBER	6/21/90
FRACTIONS	±1/32	CHECKED P. A. O' CONNOR	6/22/90
DECIMALS (XX)	±0. 020	APPROVED D. H. MUHLRAD	6/22/90
DECIMALS (XXX)	±0. 010	APPROVED	
ANGLES	±1/2°		

SQUARE CORNERS AND ANGLES ARE 90° UNLESS OTHERWISE SPECIFIED.

MATERIAL:

FINISH:

C&D TECHNOLOGIES
Power Solutions

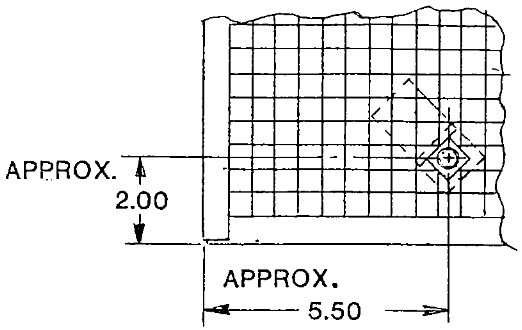
LIGHTNING ARRESTOR INSTALLATION HRT 12-1/4 CABINET

SIZE	DOC TYPE / NUMBER	ISSUE
B	MBC-5488	0

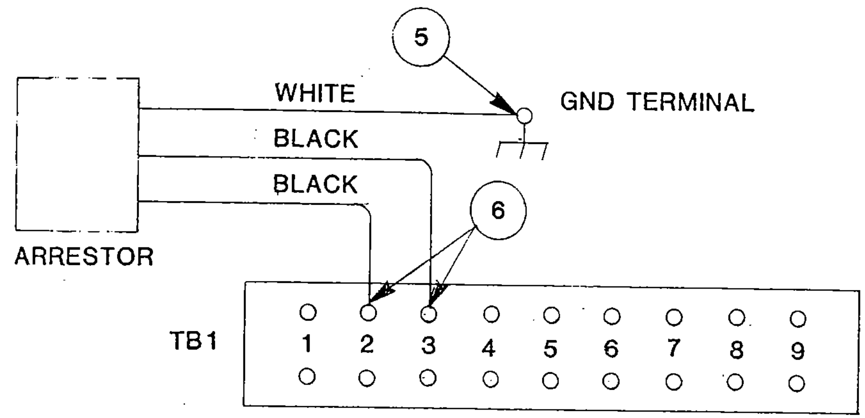
SCALE:	SHEET:	FILE NAME:
N/A	1 OF 1	MBC5488_SHT_1_ISS_0

REVISIONS

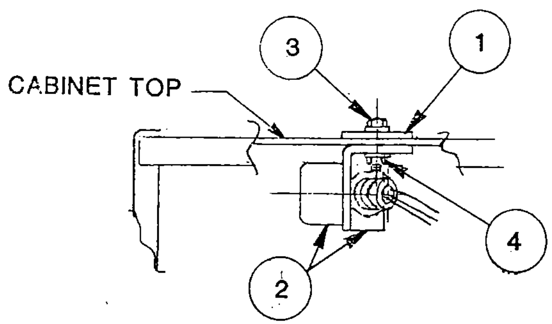
ZONE	REV. LEV.	DESCRIPTION	DATE	APPROVED
	1	SEE ECN 8725	5/14/90	[illegible]



TOP (PERFORATED) FRONT OF CABINET



CONNECTION DIAGRAM



MOUNTING DETAIL

ITEM	DESCRIPTION
6	#8 LUG #14 WIRE
5	1/4" LUG #14 WIRE
4	5/16 NUT
3	5/16X3/4 BOLT
2	LIGHTNING ARRESTOR
1	MOUNTING PLATE

ISSUE	DATE	QTY
CONSHOHOCKEN		4
DUNLAP		
PURCHASING		

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON: ±

DECIMALS			ANGLES
X	XX	XXX	

MATERIAL:

		DATE
DRAWN	E. GREISS	6/14/89
CHECKED	P.A. O'CONNOR	6/15/89
APPROVED	D.B. Wilson	6/16/89
APPROVED		
ISSUED		

C&D TECHNOLOGIES, INC.
Power Solutions

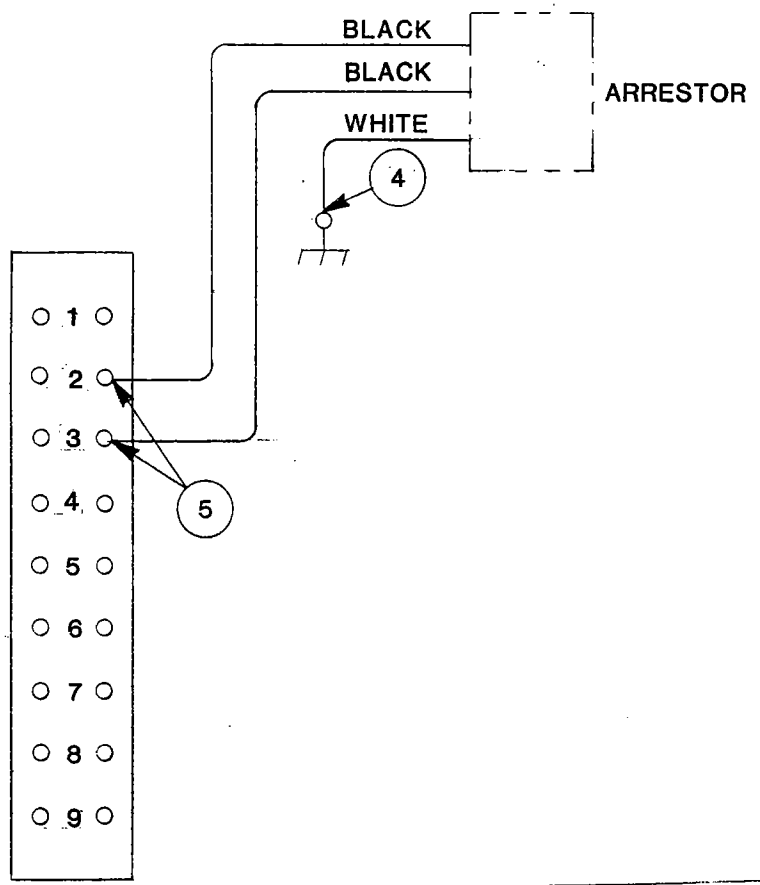
LIGHTNING ARRESTOR INSTALLATION
HRT 24/100, HRT 48/50

SIZE B | CODE IDENT. NO. | KBC-5295

SCALE ~ | REV. LEVEL 1 | SHEET 1 OF 1

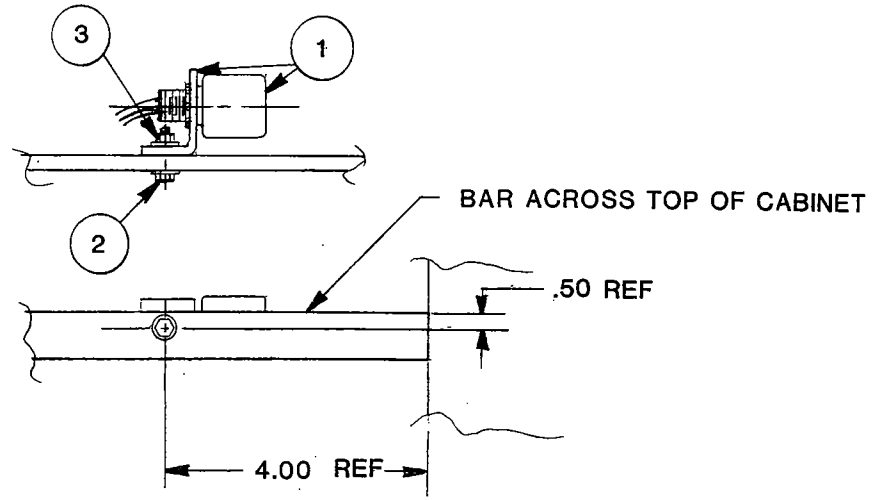
OBSOLETE - FOR RECORD ONLY

ZONE	REV. LEV.	DESCRIPTION	DATE	APPROVED
	1	SEE ECN 8725	6/4/90	



TB1

CONNECTION DIAGRAM



ITEM	DESCRIPTION
5	#10 LUG #14 WIRE
4	1/4 LUG #14 WIRE
3	5/16 NUT
2	5/16X1 BOLT
1	LIGHTNING ARRESTOR

ISSUE	DATE	QTY
CONSHOHOCKEN		4
DUNLAP		
PURCHASING		

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
± TOLERANCES ON:
DECIMALS: X ±, XX ±, XXX ±
ANGLES: ½
MATERIAL:

DRAWN	E. GREISS	6/14/89
CHECKED	P.A. O'CONNOR	6/15/89
APPROVED	D.B. Wilson	6/16/89
APPROVED		
ISSUED		

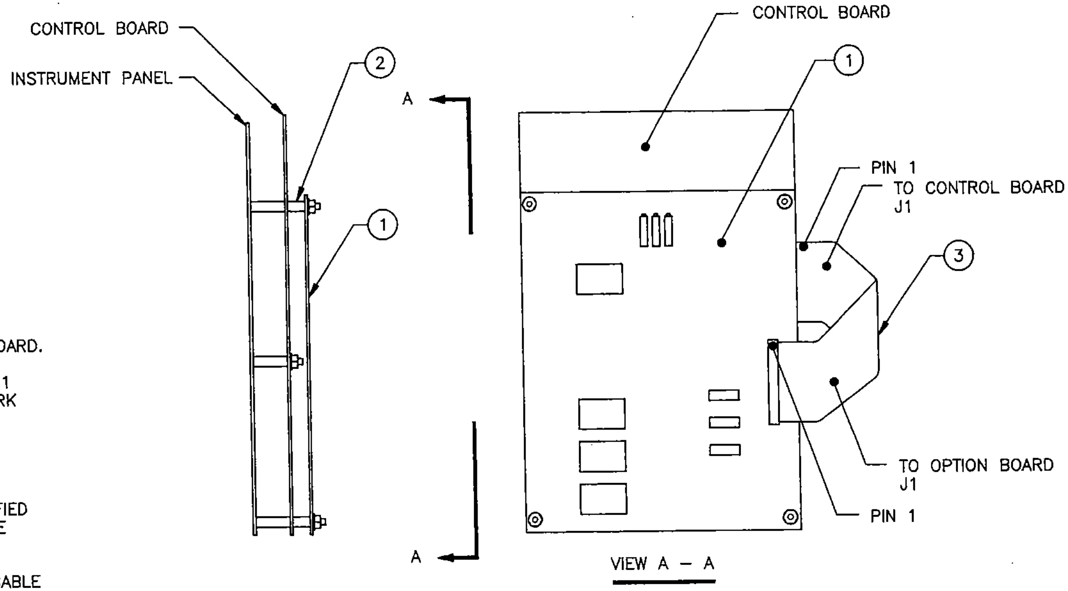
C&D TECHNOLOGIES, INC.
Power Solutions

LIGHTNING ARRESTOR INSTALLATION
HRT 48/100

SIZE	CODE IDENT. NO.	
B		KBC-5296

SCALE ~ | REV. LEVEL 1 | SHEET 1 OF 1

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED



1. REMOVE THE NUTS HOLDING THE CONTROL BOARD.
2. CONNECT THE RIBBON CABLE ASSEMBLY TO J1 ON THE CONTROL BOARD. THE IDENTIFIER MARK SHOULD BE TOWARDS PIN 1.
3. REPLACE THE CONTROL BOARD.
4. MOUNT THE OPTION BOARD ON TOP OF THE CONTROL BOARD AS SHOWN WITH THE SPECIFIED HARDWARE. THE COMPONENT SIDE SHOULD BE FACING OUT.
5. CONNECT THE OTHER END OF THE RIBBON CABLE ASSEMBLY TO J1 ON THE OPTION BOARD. THE IDENTIFIER MARK SHOULD BE TOWARDS PIN 1.
6. VERIFY THE HRT'S INTERNAL WIRING DOES NOT REST AGAINST THE OPTION BOARD. IF NECESSARY CAREFULLY BEND ANY WIRES AWAY FROM THE BOARD'S LOCATION.

ITEM	DESCRIPTION
3	HARNESS, RIBBON
2	STANDOFF
1	OPTION BOARD

ISSUE	DATE	QTY
CONSHOHOCKEN		4
[illegible]		
PURCHASING		

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES ± TOLERANCES ON: DECIMALS .X .XX .XXX ANGLES

MATERIAL:

		DATE
DRAWN	P.A.O'CONNOR	10/26/90
CHECKED	[signature]	10/26/90
APPROVED	D.H. Muhlhead	10/26/90
APPROVED		
ISSUED		

C&D TECHNOLOGIES, INC.
Power Solutions

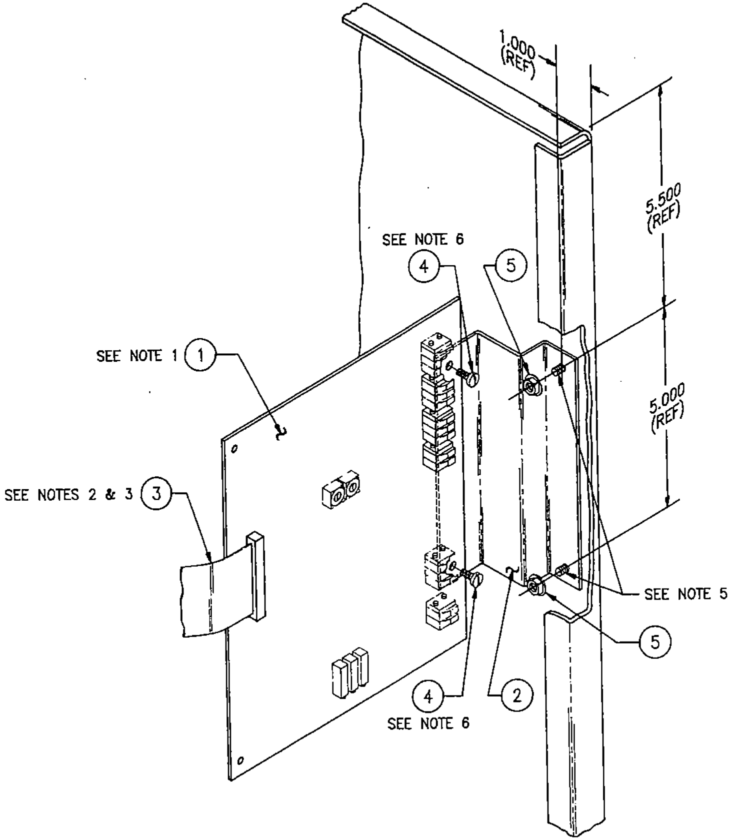
INSTALLATION
HRT OPTION BOARD, 12–1/4 CABINET

SIZE C | CODE IDENT. NO. | MBC–5466

SCALE 1/2 | REV. LEVEL | SHEET 1 OF 1

OBSOLETE - FOR RECORD ONLY

REVISIONS				
ZONE	REV LEV	DESCRIPTION	DATE	APPROVED



NOTES:

1. MOUNT BOARD AS SHOWN WITH SPECIFIED HARDWARE.
2. CONNECT RIBBON CABLE ASSEMBLY (ITEM 3) TO J1 ON THE OPTION BOARD. THE IDENTIFIER MARK SHOULD BE TOWARD PIN 1.
3. CONNECT THE OTHER END OF THE RIBBON CABLE ASSEMBLY TO J1 ON THE CONTROL BOARD. THE IDENTIFIER MARK SHOULD BE TOWARD PIN 1.
4. VERIFY THE HRT'S INTERNAL WIRING DOES NOT REST AGAINST THE OPTION BOARD. IF NECESSARY, CAREFULLY BEND ANY WIRES AWAY FROM THE BOARD'S LOCATION.
5. THREADED STUD IS PART OF CHASSIS SIDE.
6. MATING NUT IS PART OF ITEM 2.

ITEM	DESCRIPTION
5	NUT
4	SCREW
3	HARNESS
2	BRACKET
1	P.C. BOARD

ISSUE	DATE	QTY
CONSHOHOCKEN		4
...		4
PURCHASING		

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
± TOLERANCES ON:

DECIMALS X	XX	XXX	ANGLES
	.03	.010	1/2°

MATERIAL:

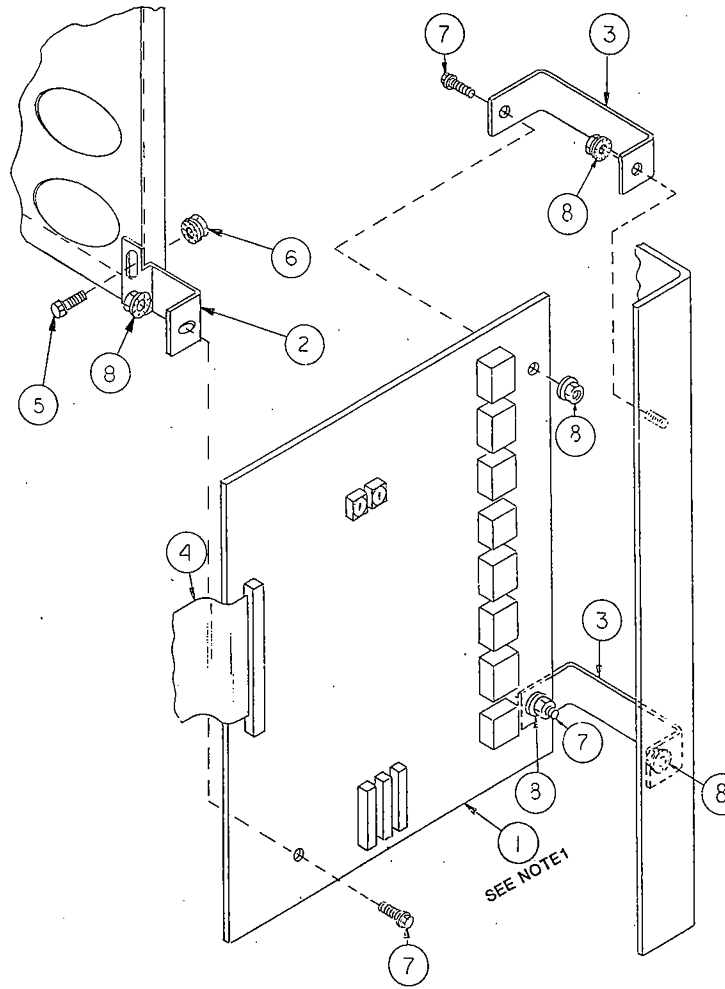
		DATE
DRAWN	G. D. HAWKINS	5-12-91
CHECKED	G.A. O'Conner	5/24/91
APPROVED	D.B. Weber	5/24/91
APPROVED		
ISSUED		

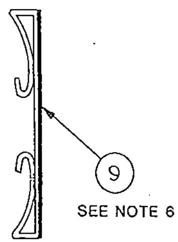
C&D TECHNOLOGIES, INC.
Power Solutions

INSTALLATION
HRT UTILITY OPTION BOARD, 17.5" CABINET

SIZE	CODE IDENT. NO.	
C		MBC-5542
SCALE 1:2	REV. LEVEL	SHEET 1 OF 1

REVISIONS				
ZONE	REV. LEV.	DESCRIPTION	DATE	APPROVED





NOTES:

1. MOUNT BOARD AS SHOWN WITH SPECIFIED HARDWARE.
2. SELECT NOMINAL SYSTEM VOLTAGE, 24 OR 48 VOLTS, BY MOVING THE JUMPER ON J4 TO THE APPROPRIATE LOCATION AS MARKED ON THE BOARD.
3. CONNECT RIBBON CABLE ASSEMBLY (ITEM 4) TO J1 ON THE BOARD. THE IDENTIFIER MARK IS TO BE TOWARD PIN 1.
4. CONNECT THE OTHER END OF THE RIBBON CABLE ASSEMBLY TO J1 ON THE CONTROL BOARD. THE IDENTIFIER MARK IS TO BE TOWARD PIN 1.
5. VERIFY THE HRT'S INTERNAL WIRING DOES NOT REST AGAINST THE OPTION BOARD. IF NECESSARY CAREFULLY BEND ANY WIRES AWAY FROM THE BOARD'S LOCATION.
6. AFFIX ITEM 9 VERTICALLY ON THE SIDE OF THE DC CIRCUIT BREAKER. PLACE THE RIBBON CABLE IN ITEM 9.
7. EARLY PRODUCTION MODELS MAY NOT HAVE PROVISIONS FOR ATTACHING BRACKET #2. IF NO HOLE IS PROVIDED, ASSOCIATED HARDWARE MAY BE DISCARDED.
8. EARLY PRODUCTION MODELS MAY HAVE A BUSBAR FROM THE CAPACITOR ASSEMBLY TOUCHING THE BACK OF THE OPTION BOARD. THIS CONDITION IS ACCEPTABLE PROVIDED THAT: A) THE BUSBAR HAS AT LEAST 1/8 INCH CLEARANCE BETWEEN THE CIRCUIT BOARD TRACES, AND B) THE BUSBAR DOES NOT PLACE EXCESSIVE PRESSURE ON THE BOARD.

ITEM	DESCRIPTION
9	WIRE SUPPORT
8	NUT, #6
7	SCREW, #6
6	NUT, #8
5	SCREW, #8
4	HARNESS
3	BRACKET
2	BRACKET, SLOTTED
1	BOARD

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES ± TOLERANCES ON: DECIMALS .X .XX .XXX ANGLES

MATERIAL:

DRAWN	R.B. WEBER	5-25-90
CHECKED	David R. Weber	5/25/90
APPROVED	D.H. Mulhol	5/25/90
APPROVED		
ISSUED		

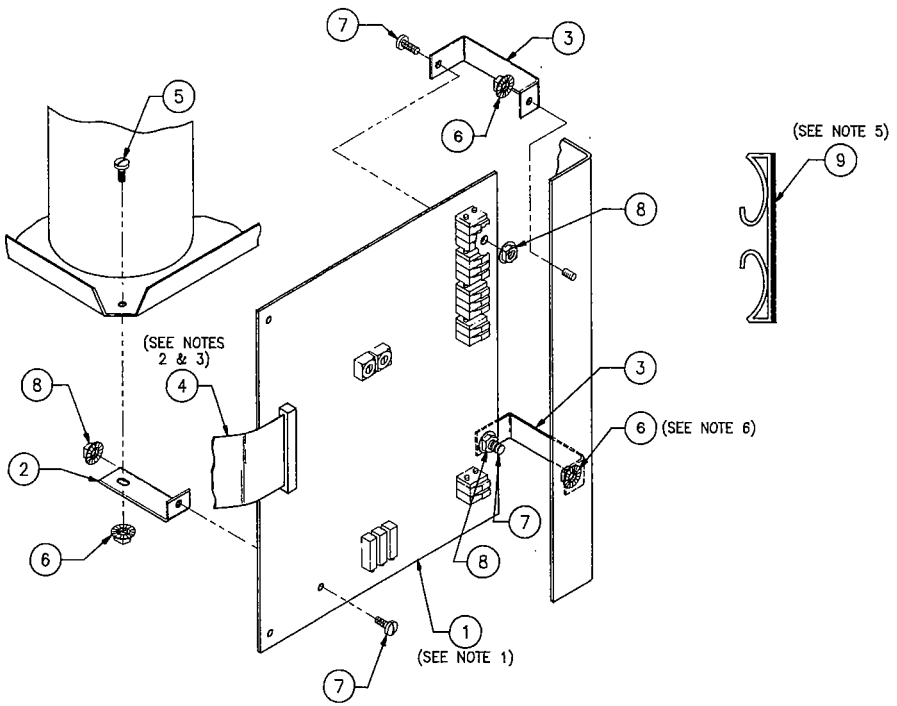
C&D TECHNOLOGIES, INC.
Power Solutions

INSTALLATION
HRT OPTION BOARD
24" CABINET - 24 VOLT

SIZE: C | CODE IDENT. NO. | MBC-5471

SCALE | REV. LEVEL | SHEET 1 OF 1

ZONE	REV.	DESCRIPTION	DATE	APPROVED
	1	SEE ECN 9281	10/22/91	



NOTES:

1. MOUNT BOARD AS SHOWN WITH SPECIFIED HARDWARE.
2. CONNECT RIBBON CABLE ASSEMBLY (ITEM 4) TO J1 ON THE OPTION BOARD. THE IDENTIFIER MARK SHOULD BE TOWARD PIN 1.
3. CONNECT THE OTHER END OF THE RIBBON CABLE ASSEMBLY TO J1 ON THE CONTROL BOARD. THE IDENTIFIER MARK SHOULD BE TOWARD PIN 1.
4. VERIFY THE HRT'S INTERNAL WIRING DOES NOT REST AGAINST THE OPTION BOARD. IF NECESSARY, CAREFULLY BEND ANY WIRES AWAY FROM THE BOARD'S LOCATION.
5. AFFIX ITEM 9 VERTICALLY ON THE SIDE OF THE DC CIRCUIT BREAKER. PLACE THE RIBBON CABLE IN ITEM 9.
6. THREADED STUD IS PART OF CHASSIS SIDE.

ITEM	DESCRIPTION
9	WIRE SUPPORT
8	NUT
7	SCREW
6	NUT
5	SCREW
4	HARNESS
3	BRACKET
2	BRACKET, SLOTTED
1	P.C. BOARD

ISSUE	DATE	QTY
CONFIGURATION		
PRODUCTION		

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
± TOLERANCES ON:
DECIMALS: X .1, XX .03, XXX .010; ANGLES 1/2°
MATERIAL:

DRAWN	G. D. HAWKINS	5-16-91
CHECKED	[illegible]	5/29/91
APPROVED	[illegible]	5/24/91
APPROVED		
ISSUE		

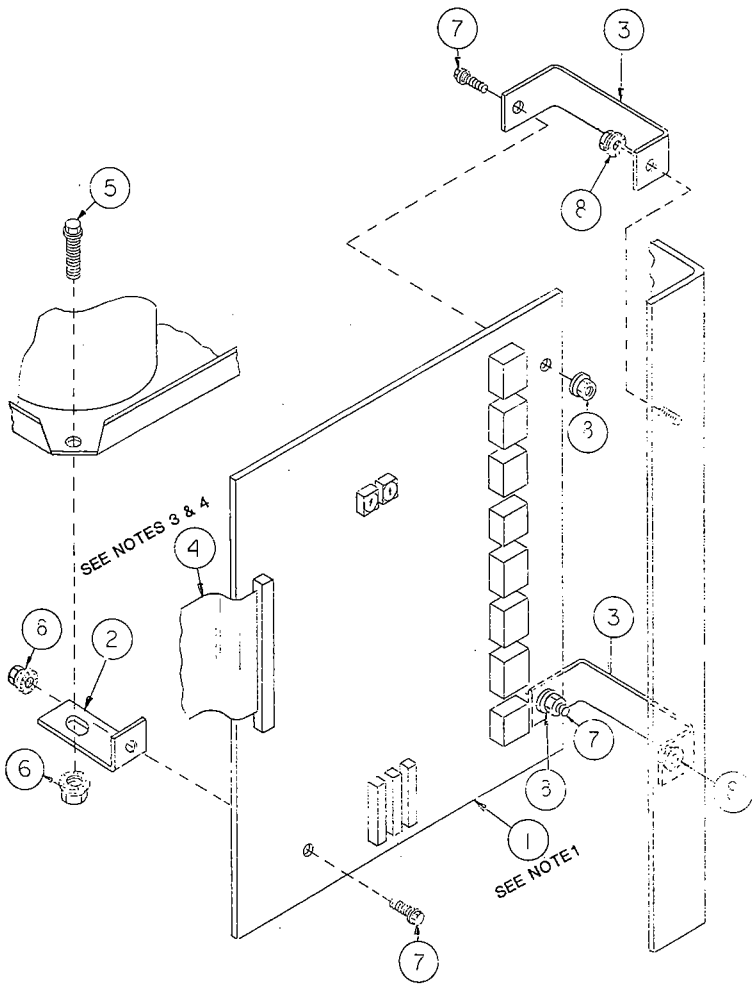
C&D TECHNOLOGIES, INC. Power Solutions

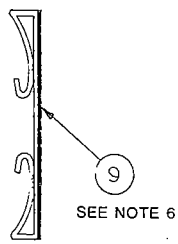
INSTALLATION
HRT UTILITY OPTION BOARD, 24" CABINET

SIZE C | CAGE NET. NO. | MBC-5543

SCALE 1:2 | REV. LEVEL 1 | SHEET 1 OF 1

REVISIONS			
ZONE	REV. LTR	DESCRIPTION	DATE	APPROVED
	1	SEE ECN-8445	6/24/89	DBU.L.
	2	SEE ECN 8674	3-4-90	DBU.L.





NOTES:

1. MOUNT BOARD AS SHOWN WITH SPECIFIED HARDWARE.
2. SELECT NOMINAL SYSTEM VOLTAGE, 24 OR 48 VOLTS, BY MOVING THE JUMPER ON J4 TO THE APPROPRIATE LOCATION AS MARKED ON THE BOARD.
3. CONNECT RIBBON CABLE ASSEMBLY (ITEM 4) TO J1 ON THE BOARD. THE IDENTIFIER MARK IS TO BE TOWARD PIN 1.
4. CONNECT THE OTHER END OF THE RIBBON CABLE ASSEMBLY TO J1 ON THE CONTROL BOARD. THE IDENTIFIER MARK IS TO BE TOWARD PIN 1.
5. VERIFY THE HRT'S INTERNAL WIRING DOES NOT REST AGAINST THE OPTION BOARD . IF NECESSAY CAREFULLY BEND ANY WIRES AWAY FROM THE BOARD'S LOCATION.
6. AFFIX ITEM 9 VERTICALLY ON THE SIDE OF THE DC CIRCUIT BREAKER. PLACE THE RIBBON CABLE IN ITEM 9.

ITEM	DESCRIPTION
9	WIRE SUPPORT
8	NUT, #6
7	SCREW, #6
6	NUT, #8
5	SCREW, #8
4	HARNESS
3	BRACKET
2	BRACKET, SLOTTED
1	BOARD

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ON: DECIMALS .X ±.1, .XX ±.02; ANGLES ±1°	DRAWN	RATCLIFFE. 10-4-88
	CHECKED	10/10/88
	APPROVED	10/10/88
MATERIAL:	APPROVED	
	ISSUED	

C&D TECHNOLOGIES, INC. Power Solutions

INSTALLATION
HRT OPTION BOARD
24" CABINET - 48 VOLT

SIZE	CAGE/DWG. NO.	
C		MBC-5333
SCALE	REV. LEVEL 2	SHEET 1 OF 1

MBC-5333

OBSOLETE - FOR RECORD ONLY

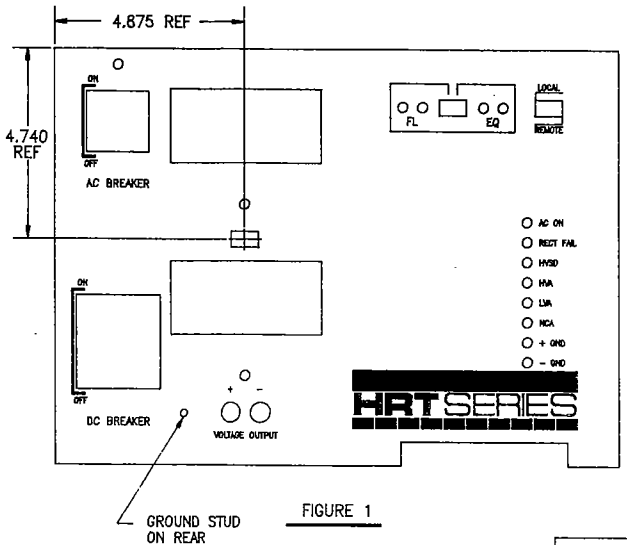


FIGURE 1

INSTRUCTIONS

1. DE-ENERGIZE THE UNIT BY OPENING THE AC AND DC CIRCUIT BREAKERS. DISCHARGE THE FILTER CAPACITORS.
2. LOCATE THE LABEL-COVERED HOLE INDICATED IN FIGURE 1.
3. WITH A SHARP KNIFE OR SINGLE-EDGE RAZOR BLADE, CAREFULLY CUT A HOLE IN THE LABEL THE SAME SIZE AS THE HOLE IN THE METAL PANEL.
4. USING STANDOFFS, WASHERS, AND NUTS PROVIDED WITH THE SWITCH, MOUNT AS SHOWN IN FIGURE 2.
5. SOLDER A 1 INCH NO. 18 GREEN WIRE (128) FROM TERMINAL 3 TO 4 OF GROUND SWITCH.
6. CRIMP LUG, ITEM 4, TO ONE END OF 8 INCH NO. 18 GREEN WIRE (127). CONNECT LUG TO GROUND STUD ON REAR OF INSTRUMENT PANEL. SOLDER OTHER END TO TERMINAL 3 OF SWITCH.
7. CUT RED WIRE (125) OF GROUND SWITCH LOOP (DCB-2 TO VM-(+)). SOLDER DCB-2 LEAD (125) TO TERMINAL 1 OF SWITCH. SOLDER VM-(+) LEAD (65) TO TERMINAL 2 OF SWITCH.
8. CUT BLACK WIRE (126) OF GROUND SWITCH LOOP (DCB-4 TO VM-(-)). SOLDER DCB-4 LEAD (126) TO TERMINAL 6 OF SWITCH. SOLDER VM-(-) LEAD (66) TO TERMINAL 5 OF SWITCH.
9. INSPECT THE SWITCH INSTALLATION. VERIFY THE SWITCH IS SECURELY MOUNTED. VERIFY THE CONNECTIONS TO THE SWITCH ARE SECURE AND NO STRAY WIRE OR SOLDER HAS CREATED ANY SHORTS.
10. AFFIX LABEL, ITEM 2, AT GROUND SWITCH AS SHOWN IN FIGURE 3.
11. RETURN THE UNIT TO SERVICE.

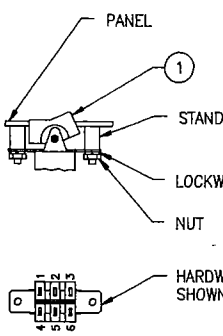


FIGURE 2
REAR OF SWITCH

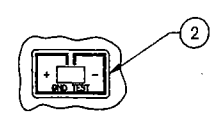
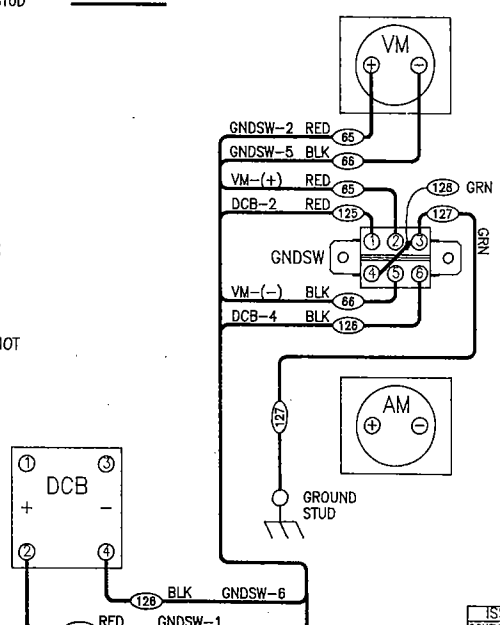


FIGURE 3



ITEM	DESCRIPTION
4	LUG
3	WIRE
2	LABEL
1	SWITCH

ISSUE	DATE	QTY
CONSHOHOCKEN		4
DUNLAP		4
PUR AS		

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES ± TOLERANCES ON: DECIMALS .X ±.1, .XX ±.01, .XXX ±.005, ANGLES ±1°

MATERIAL:

		DATE
DRAWN	R. B. WEBER	4/26/91
CHECKED		5/9/91
APPROVED		5/9/91
APPROVED		
ISSUED		

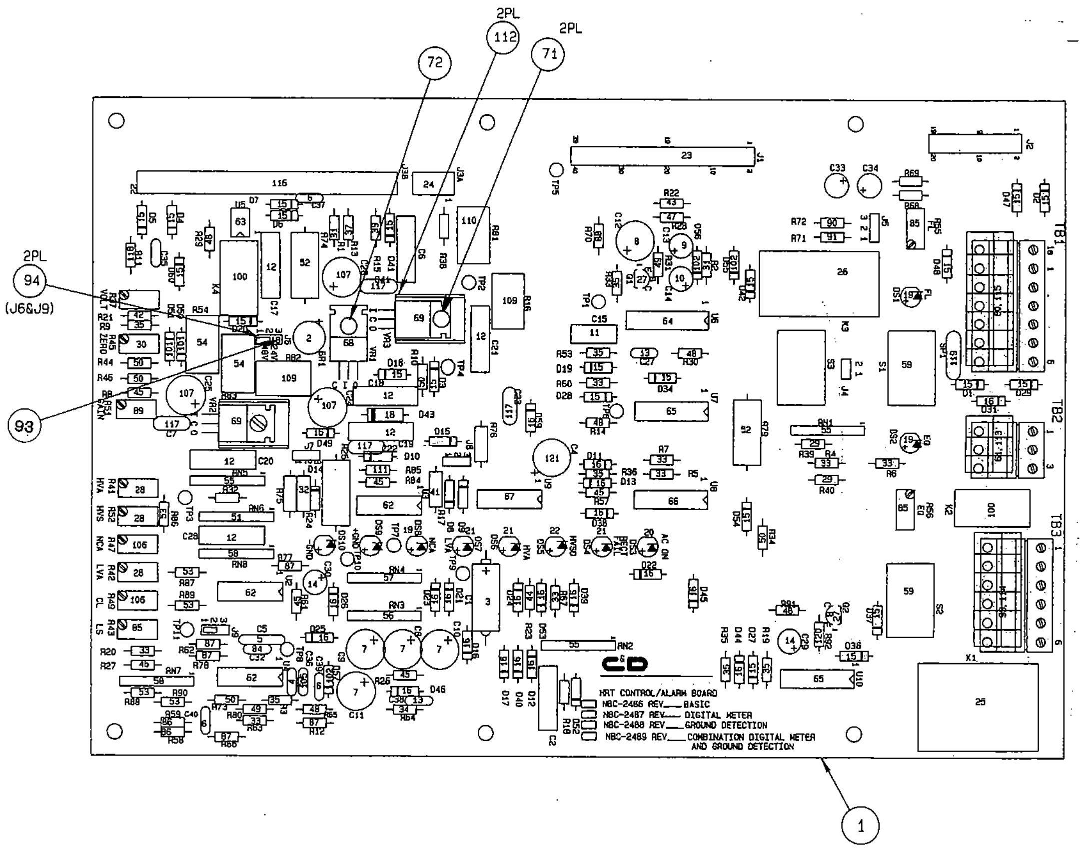
C&D TECHNOLOGIES, INC. Power Solutions

INSTALLATION AND CONNECTION GROUND SWITCH ON VOLTMETER HRT SERIES

SIZE C | CODE IDENT. NO. | MBC-5545

SCALE 1:1 | REV. LEVEL | SHEET 1 OF 1

REV.		DESCRIPTION	REV. BY	DATE	APPROVED
1		SEE ECN 10298	KEL	11/14/94	MCM
2		SEE ECN 10383	RHM	3/20/95	MCM



NBC-2486

NOTES:

1. NUMBERS INSIDE OR ADJACENT TO COMPONENTS INDICATE ITEM NUMBER.
2. MARK PART NUMBER AND REVISION LEVEL IN AREA SHOWN, DATA CODE. USE NON-CONDUCTIVE INK/LABEL.
3. ALL DIM. ARE FOR REFERENCE ONLY.
4. THIS ASSEMBLY CONTAINS STATIC SENSITIVE "MOS" COMPONENTS. THEY MUST BE INSERTED BY A GROUNDED OPERATOR AT A GROUNDED ANTI-STATIC WORKSTATION. AFTER INSTALLATION OF "MOS" COMPONENTS, ASSEMBLY MUST BE PUT IN AN ANTI-STATIC CONTAINER FOR TRANSPORT BETWEEN OPERATIONS OR FOR FINAL SHIPMENT.
5. ADDITIONAL JUMPER POSITIONS (IF JUMPERS ARE PRESENT):
   J4– REMOVE FOR 200A UNITS
   J5– MOVE TO PINS 2&3 FOR 200A UNITS
   J6– MOVE TO PINS 2&3 FOR 24V APPLICATIONS
   J7– MOVE TO PINS 2&3 FOR REMOTE SENSING

COMPONENTS (USED ON ALL BOARDS)

ITEM NUMBER	DESCRIPTION
001	DRILLING
002	BR1
003	C1
004	C3
005	C5
006	C37, 39, 40
007	C8–11
008	C12
009	C13
010	C14
011	C15
012	C17–21, 28
013	C27, 38
014	C29, 30
015	D1–7, 18–20, 27–29, 31, 34, 36, 37, 41, 42, 47–49, 54, 60
016	D11–13, 16, 17, 21–26, 38–40, 44–46, 53, 59
018	D43
019	DS1, 2, 8
020	DS3
021	DS4, 6, 7
022	DS5
023	J1
024	J3A
025	K1
026	K3
027	Q1
028	R41, 42, 52
029	R39, 40
030	R45
031	R1, 2
032	R24
033	R4–7, 20, 60, 63, 67
034	R64
035	R3, 9, 19, 33, 35, 36, 53
037	R13
039	R15
041	R17
042	R21
043	R22
044	R23
045	R8, 26, 57, 61, 84
046	R27
047	R28
048	R14. 29, 30, 65, 91
049	R31, 80
050	R10, 34, 44, 46, 73
051	RN6
052	R74, 79
053	R86–90
054	R54, 83
055	RN1, 2, 5
056	RN3
057	RN4
058	RN7, 8
059	S1, 2
060	TB1
061	TB2
062	U2–4
063	U5
064	U6
065	U7, 10
066	U8
067	U9
068	VR1
069	VR2,3
084	C32
085	R43, 55, 56
086	R58, R59
087	R12, 62, 66, 77, 78
088	R70
089	R51
090	R72
091	R71
093	J6, 9
099	TB3
100	K2,4
101	D50, 51
102	D52, 55–57
105	C36
106	R47, 49
107	C24–26
109	R16, 82
110	R81
111	R85
113	TB2
117	C7, 22, 23, 41
118	R11
119	SP1
120	R92
121	C4

	DATE
DRAWN D.B. WILSON	7/29/92
CHECKED D.H. MUHLRAD	7/29/93
APPROVED P.S. ALEXANDER	7/29/93
APPROVED	

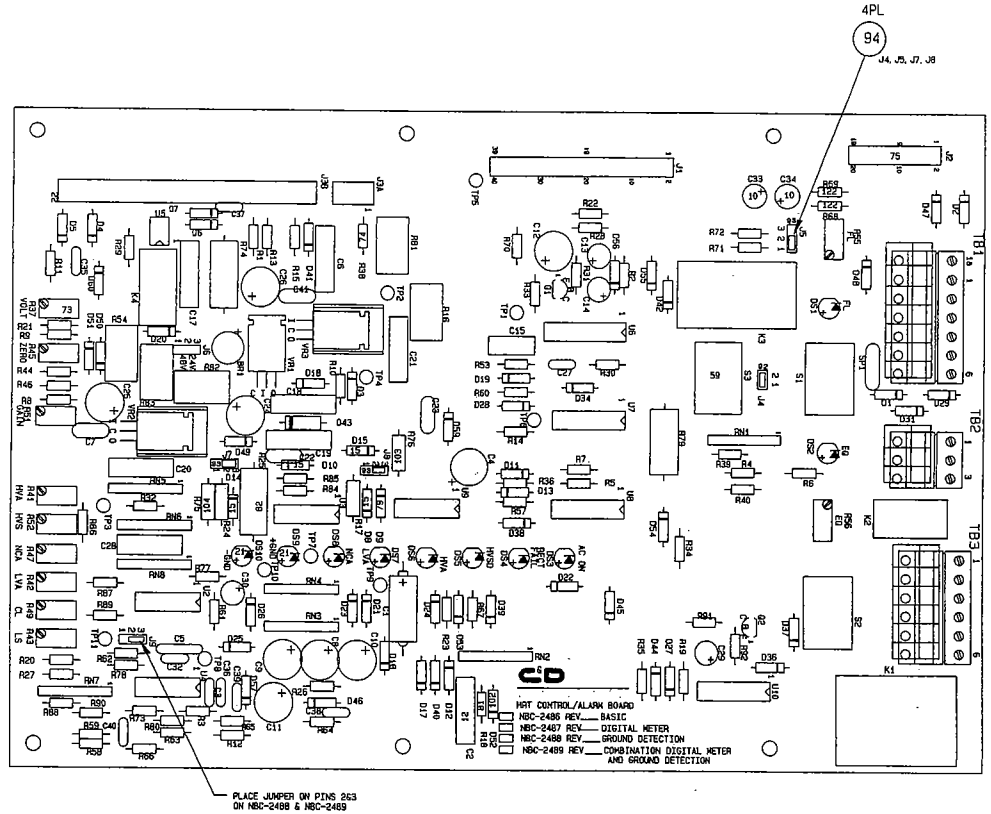
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES ± TOLERANCES ON DECIMALS .XX 0.020 .XXX 0.010 ANGLES

C&D TECHNOLOGIES, INC.
Power Solutions

HRT CONTROL/ALARM BOARD ASSEMBLY

SIZE D | BLANK SIZE | NBC-2486

SCALE 1.5=1 | REV. LEVEL 2 | SHEET 1 OF 2



NBC-2487 , NBC-2488 OR NBC-2489

NBC-2487

ADDITIONAL COMPONENTS ARE:

ITEM 10 - C33, C34
ITEM 59 - S3
ITEM 73 - R37
ITEM 74 - R38
ITEM 75 - J2
ITEM 94 - *J4, J5
ITEM 122- R68, 69

ITEM 92 - J4
ITEM 93 - J5

NBC-2488

ADDITIONAL COMPONENTS ARE:

ITEM 12 - C2
ITEM 15 - - - C8, 10, 14, 15
ITEM 21 - - - C59, 10
ITEM 79 - - - D9
ITEM 81 - - - D18
ITEM 82 - - - R25
ITEM 94 - - - *J7, 8
ITEM 102- - - D52
ITEM 103- - - R76
ITEM 104- - - R75

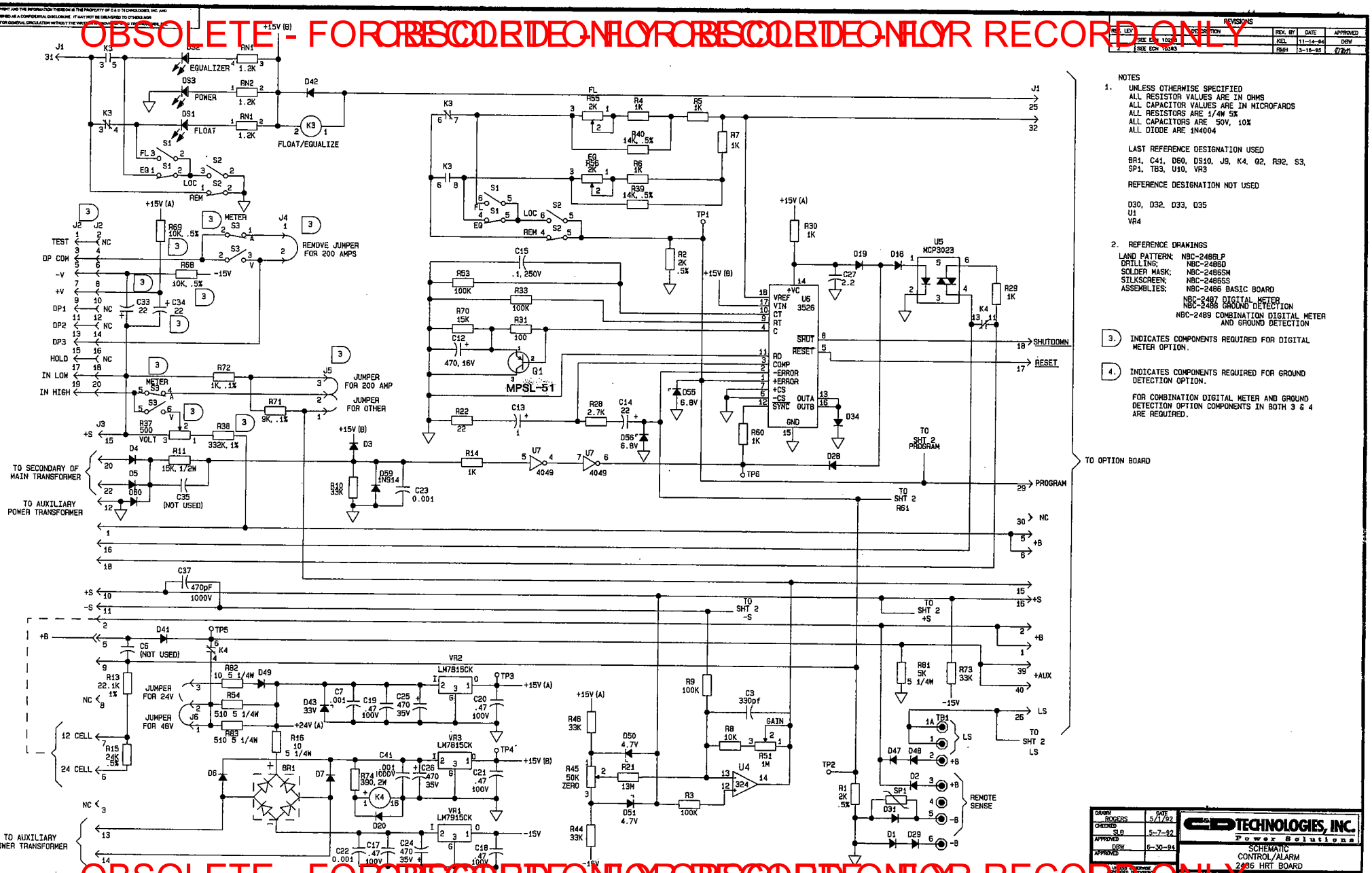
ITEM 93 - J7, J8

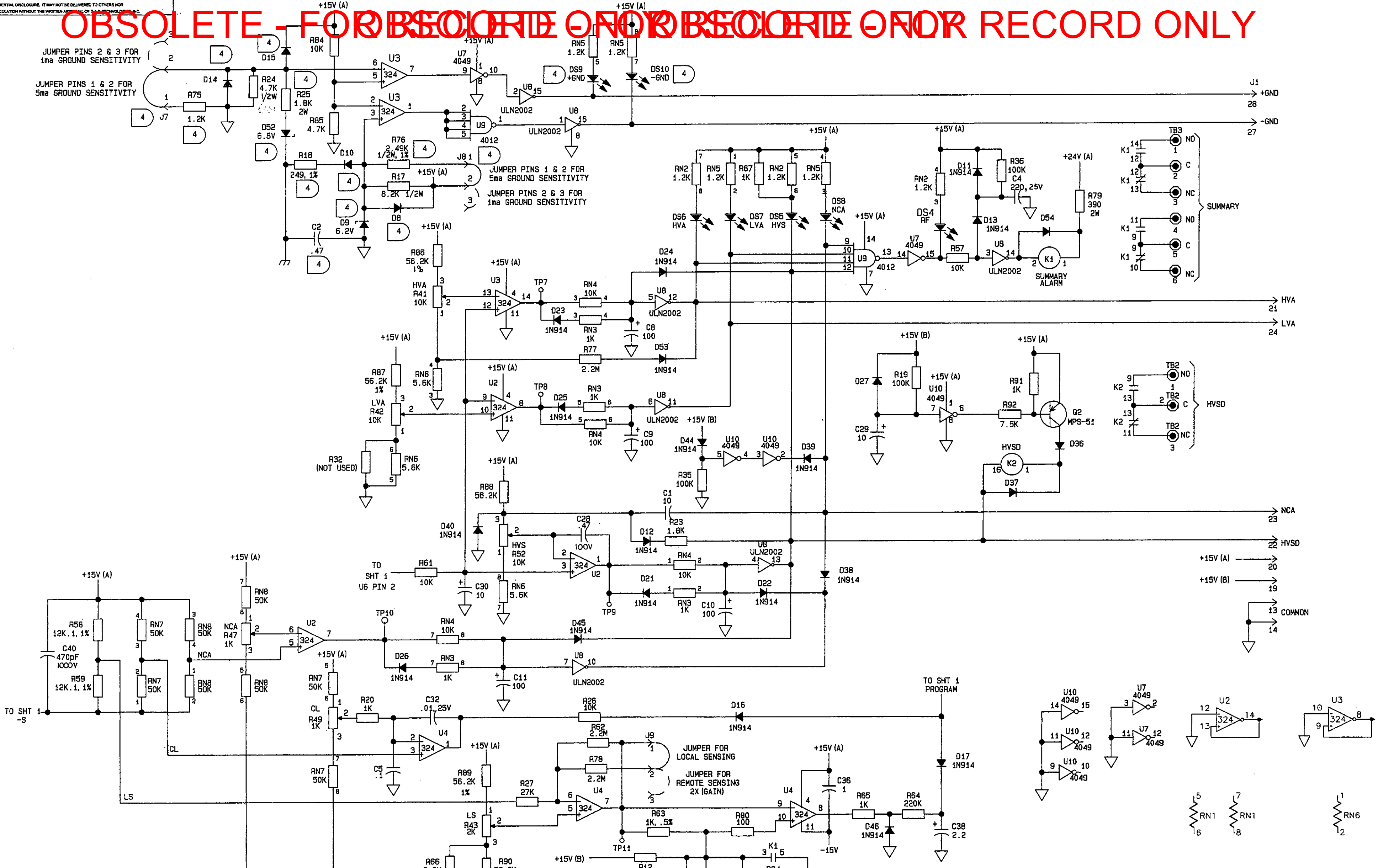
NBC-2489

CONSIST OF THE COMPONENTS
FOR BOTH NBC-2487 & NBC-2488

SIZE		
D	BLANK SIZE	NBC-2486
SCALE 1.5=1	REV. LEVEL 2.	SHEET 2 OF 2

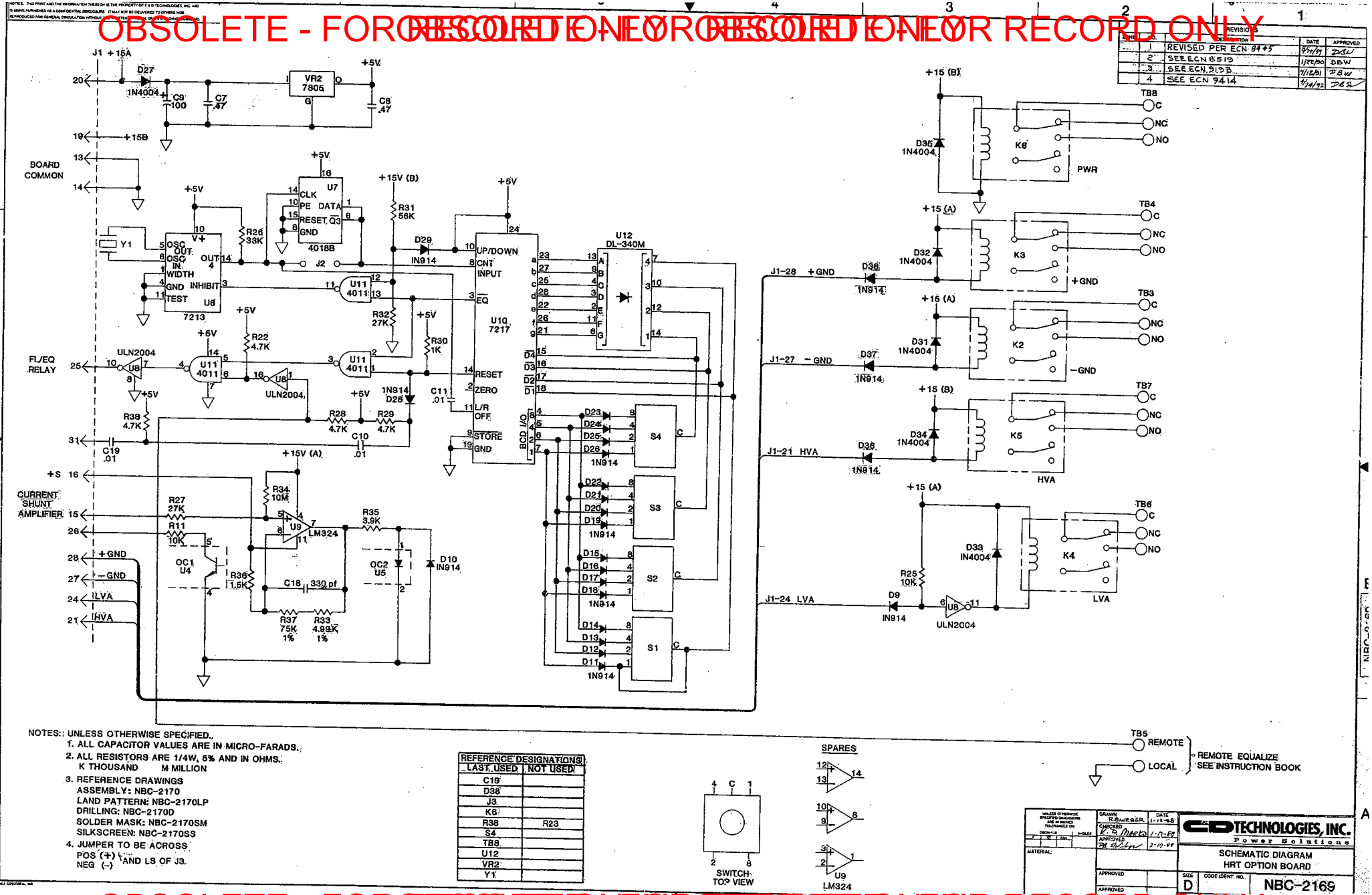
OBSOLETE - FOR RECORD ONLY





OBSOLETE - FOR RECORD ONLY

SIZE D	BLANK SIZE	NBC-2486SD
SCALE 1=1	REV. LEVEL 2	SHEET 2 OF 2



NOTES: UNLESS OTHERWISE SPECIFIED.
1. ALL CAPACITOR VALUES ARE IN MICRO-FARADS.
2. ALL RESISTORS ARE 1/4W, 5% AND IN OHMS.
   K THOUSAND M MILLION
3. REFERENCE DRAWINGS
   ASSEMBLY: NBC-2170
   LAND PATTERN: NBC-2170LP
   DRILLING: NBC-2170D
   SOLDER MASK: NBC-2170SM
   SILKSCREEN: NBC-2170SS
4. JUMPER TO BE ACROSS POS (+) AND LS OF J3.

REFERENCE DESIGNATIONS	
LAST USED	NOT USED
C19	
D38	
J3	
K6	
R38	R23
S4	
TB8	
U12	
VR2	
Y1	

SWITCH TOP VIEW

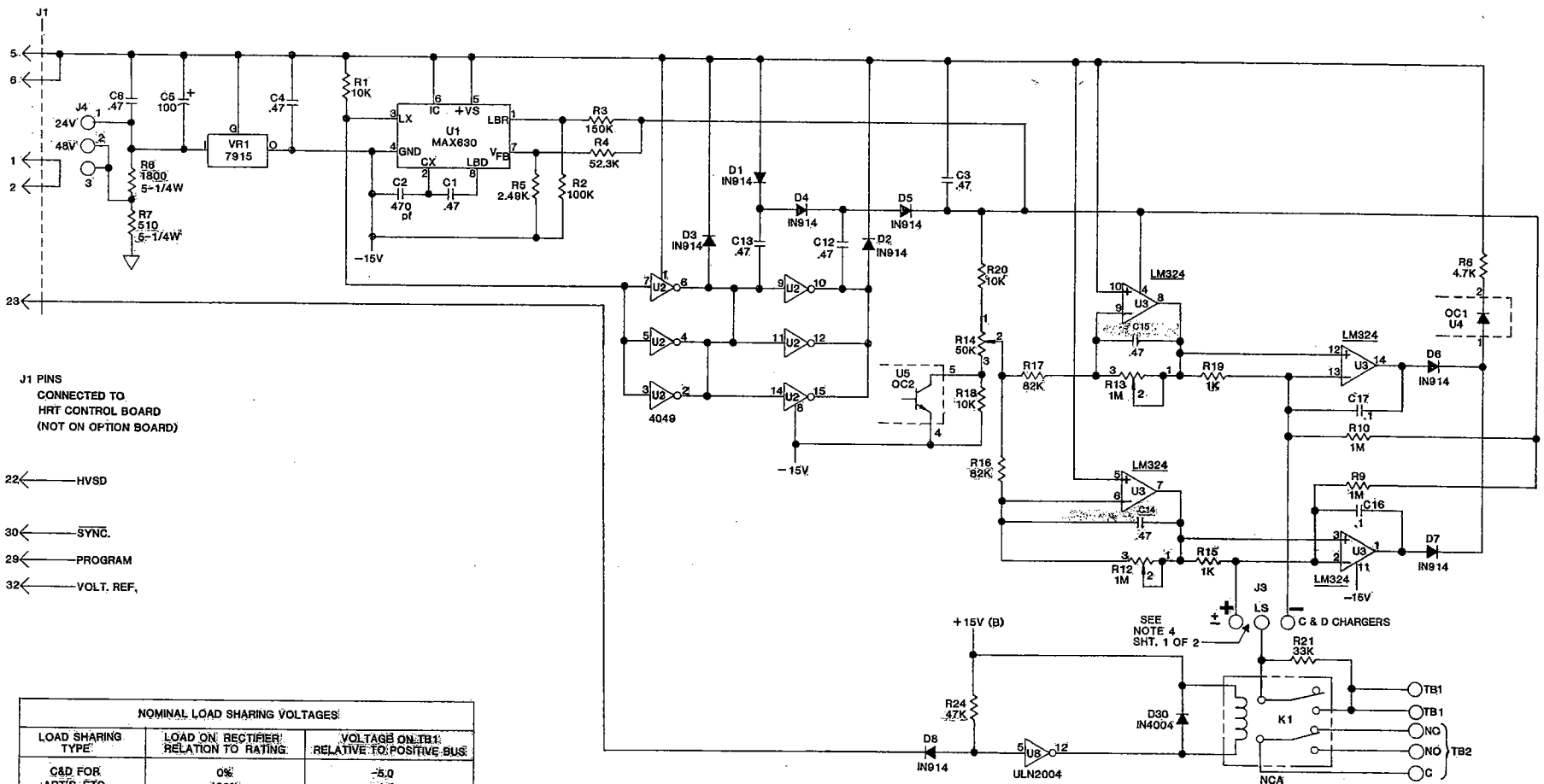
SPARES
U9 LM324

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
1	REVISED PER ECN 8445	9/11/89	DAW
2	SEE ECN 8519	1/22/90	DBW
3	SEE ECN 9153	7/12/91	DBW
4	SEE ECN 9414	4/14/92	DBW

CD TECHNOLOGIES, INC. Power Solutions

SCHEMATIC DIAGRAM
HRT OPTION BOARD

SIZE D | CODE IDENT. NO. | NBC-2169



NOMINAL LOAD SHARING VOLTAGES		
LOAD SHARING TYPE	LOAD ON RECTIFIER RELATION TO RATING	VOLTAGE ON TB1 RELATIVE TO POSITIVE BUS
C&D FOR ART'S, ETC.	0% 100%	-5.0 -4.5
NEGATIVE	0% 100%	0.0 8.0
POSITIVE	0% 100%	-10 -2.0

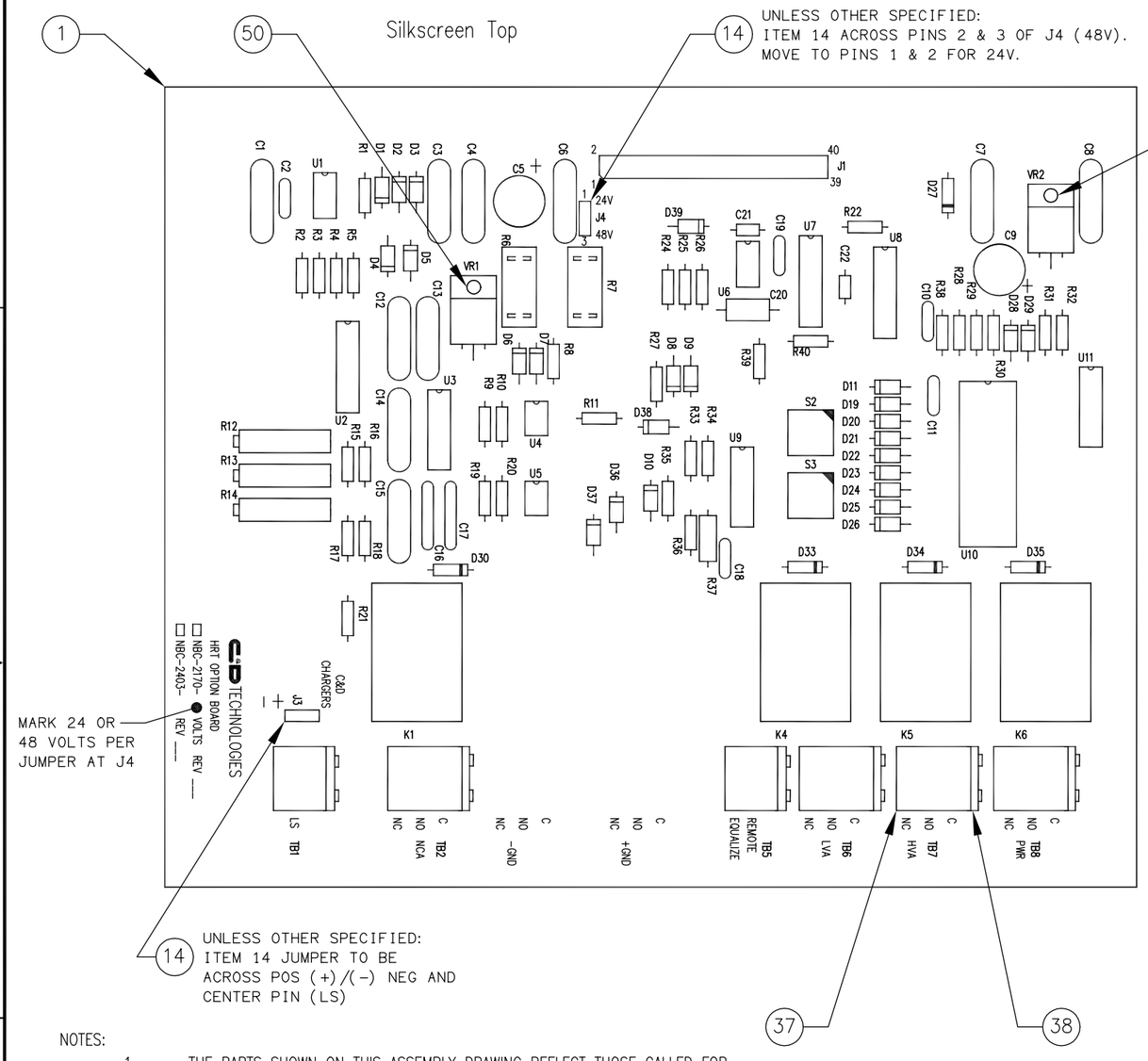
REVISIONS			
ZONE	NO.	DESCRIPTION	DATE / APPROVED

DRAWN R.WEBER 1-12-98
CHECKED R.D. MARCO 1-17-98
APPROVED [illegible] 2-12-98

C&D TECHNOLOGIES, INC. Power Solutions

SCHEMATIC DIAGRAM
HRT OPTION BOARD

SIZE D | CODE IDENT. NO. | NBC-2169
SCALE NONE | REV. NO. [illegible] | SHEET 2 OF 2



NOTES:

1. THE PARTS SHOWN ON THIS ASSEMBLY DRAWING REFLECT THOSE CALLED FOR ON THE BILL OF MATERIAL. THE SILKSCREEN WILL REFLECT LOCATIONS OF OTHER COMPONENTS THAT ARE NOT USED FOR THIS ASSEMBLY.
2. ADDITIONAL DOCUMENTS:
   - A) ARTWORK-DONE IN PADS PCB-SEE GERBER FILES (NBC2170_ISS_5.PCB).
   - B) SCHEMATIC-DONE IN ORCAD (NBC2170_SHT_2&3_ISS_5.DSN)
   - C) DRILL DRAWING DONE IN PADS PCB-NBC-2170D
3. MARK BOARD REV 5.

SEQ	Reference	Part
1		DRILLING
2	C1, C3, C4, C6, C7, C8, C12-C15	CAPACITOR
3	C2	CAPACITOR
4	C10, C11, C19, C21, C22	CAPACITOR
5	C16, C17	CAPACITOR
6	C18	CAPACITOR
7	C5, C9	CAPACITOR
8	D1-D11, D19-D26, D28, D29, D36-D39	DIODE
9	D27, D30, D33, D34, D35	DIODE
10		
11	J1	HEADER
12		
13	J3, J4	HEADER
14		JUMPER
15	K1, K4, K5, K6	RELAY
16	R1, R11, R18, R20	RESISTOR
17	R5	RESISTOR
18	R4	RESISTOR
19	R3	RESISTOR
20	R2	RESISTOR
21	R6	RESISTOR
22	R8, R22, R28, R29, R38	RESISTOR
23	R9, R10	RESISTOR
24	R12, R13	POTENTIOMETER
25	R14	POTENTIOMETER
26	R15, R19, R30	RESISTOR
27	R7	RESISTOR
28	R21, R26	RESISTOR
30	R25	RESISTOR
31	R27, R32	RESISTOR
32	R31	RESISTOR
33	R33	RESISTOR
34	R34	RESISTOR
35	R37	RESISTOR
36	S2, S3	SWITCH
37	TB1, TB2, TB5-TB8	TERMINAL
38	TB1, TB2, TB5-TB8	TERMINAL END
39	U1	INTEGRATED CIRCUIT
40	U2	INTEGRATED CIRCUIT
41	U3, U9	INTEGRATED CIRCUIT
42	U4, U5	INTEGRATED CIRCUIT
43	U6	INTEGRATED CIRCUIT
44	U7	INTEGRATED CIRCUIT
45	U8	INTEGRATED CIRCUIT
46	U10	INTEGRATED CIRCUIT
47	U11	INTEGRATED CIRCUIT
48	VR1	VOLTAGE REGULATOR
49	VR2	VOLTAGE REGULATOR
50		SNAP RIVET
54	R36	RESISTOR
55	R35	RESISTOR
56	R16, R17	RESISTOR
57	R24	RESISTOR
58	R39	RESISTOR
59	R40	RESISTOR
60	C20	CAPACITOR

ISSUES

ISSUE #	DESCRIPTION	ISS. BY ISS. DATE	APP. BY APP. DATE
5	SEE ECN 13233 Replaced obsolete IC with new part and updated the design on PADS and AUTOCAD.	KEL/SGH 01/12/01	DBW 01/18/01

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES ± TOLERANCES ON:		APPROVALS	DATE
		DRAWN R. B. WEBER	02/12/88
HOLES	+0. 004 -0. 002	CHECKED R. D. MARKO	02/16/88
FRACTIONS	±1/32	APPROVED D. B. WILSON	02/16/88
DECIMALS (XX)	±0. 020	APPROVED	
DECIMALS (XXX)	±0. 010		
ANGLES	±1/2°		

SQUARE CORNERS AND ANGLES ARE 90° UNLESS OTHERWISE SPECIFIED.

MATERIAL:

FINISH:

C&D TECHNOLOGIES
Power Solutions

ASSEMBLY
HRT OPTION BOARD

SIZE	DOC TYPE / NUMBER	ISSUE
B	NBC-2170	5

SCALE:	SHEET:	FILE NAME:
NONE	1 OF 3	NBC2170_SHT_1_ISS_5