VARCOM®

CAPACITOR CONTROLS

Communications Ready

Model 1600 & 2600

Operating & Instruction Manual

VARCOM® 2600

VARCOM® 1600

HD ELECTRIC
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VARCOM®

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Model 1600 & 2600

WARNING: Prior to installing, operating, maintaining or testing this equipment, read and understand the material in this manual. Failure to comply can result in death, severe injury and equipment damage. These instructions are intended to supplement, not replace, local safety practices and procedures.

VARCOM Capacitor Controls set the standard for ease of use by providing sophisticated control and monitoring capabilities in an intuitive easy to use package. VARWARE Control software extends these capabilities.

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OVERVIEW

The VARCOM 1600 and 2600 Capacitor Controls utilize user selectable functions and parameters to control switched capacitor banks. The VARCOM 1600 controls with time, temperature and voltage and the VARCOM 2600 add Amps and KVAR control.

TIME - The Control will close the capacitor bank when the user selected CLOSE TIME occurs. The Control will open the capacitor bank when the user selected OPEN TIME occurs. Both settings are subject to the weekend settings.

VOLTAGE - The Control will close the capacitor bank when the sensed line voltage drops below the user selected CLOSE VOLTS setting. The Control will open the capacitor bank when the sensed line voltage rises above the user selected OPEN VOLTS setting.

TIME WITH VOLTAGE OVERRIDE - The Control will function according to the time mode, except the time mode operating conditions will be overridden by voltage conditions according to the volt mode function.

TEMPERATURE - For Summer Schedule (defined by CLOSE TEMP greater than OPEN TEMP setting) - the Control will close the capacitor bank when the sensed ambient temperature rises above the user selected CLOSE TEMP setting. The Control will open the capacitor bank when the sensed ambient temperature drops below the user selected OPEN TEMP setting.

For Winter Schedule (defined by OPEN TEMP greater than CLOSE TEMP setting) - the Control will close the capacitor bank when the sensed ambient temperature drops below the user selected CLOSE TEMP setting. The Control will open the capacitor bank when the sensed ambient temperature rises above the user selected OPEN TEMP setting.

TIME WITH TEMPERATURE OVERRIDE - The Control will function according to the time mode, except the time mode operating conditions will be overridden by temperature conditions according to the temp mode function.

TEMPERATURE WITH VOLTAGE OVERRIDE - The Control will function according to the temp mode, except the temp mode operating conditions will be overridden by voltage conditions according to the volt mode function.

TIME WITH VOLTAGE AND TEMPERATURE OVERRIDE - The Control will function according to the time mode, except the time mode operating conditions will be overridden by temperature conditions according to the temp mode function and/or by voltage conditions according to the volt mode function. Voltage will override both time and temperature.

AMPS - The control will close the capacitor bank when the line amps drop below the user selected Amps setting. The control will open the capacitor bank when the line amps rise above the user selected Amps setting.

AMPS WITH VOLTAGE OVERRIDE - The Control will function according to the Amps settings, except the Amps setting operating conditions will be overridden by voltage conditions according to the volt mode function.

KVAR - The Control will close the capacitor bank when the line KVAR rises above the user selected KVAR setting. The Control will open the capacitor bank when the line KVAR drops below the user selected KVAR setting.

KVAR WITH VOLTAGE OVERRIDE - The Control will function according to the KVAR settings, except the KVAR setting operating conditions will be overridden by voltage conditions according to the volt mode function.

INSTALLATION

All VARCOM Controls are supplied ready for 4 or 6 jaw meter socket mounting or for mounting directly to a pole with a supplied mounting bracket.

WARNING: Before plugging the Control into a live meter socket, rotate the main switch out of the ***AUTO*** position or remove the front panel fuse, and observe all safety procedures for working with exposed live circuits. Failure to comply can result in death, personal injury or equipment damage.

INSTALLING INTO A RINGED BASE

Align the terminals on the back of the Control and press firmly into the meter socket. Use the supplied ring to complete the installation. Attach a ground wire to the external ground lug. Seal or lock the ring only after the entire system has been verified.

INSTALLING POLE MOUNTED CONTROLS

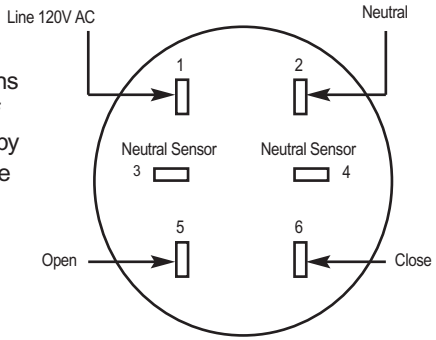
Pole Mounted Controls are mounted with the included pole bracket and user supplied mounting straps or lag screws. After the Control is attached to the pole, attach a ground wire to the external ground lug.

WIRING INSTALLATION:

Use the following wiring diagram for installing a VARCOM control:

Note that the line current sensor connections are polarity sensitive. A control indication of reverse power flow can often be corrected by reversing the black and white leads from the line current sensor from those shown in this diagram.

SERIES 1600 CONTROLS

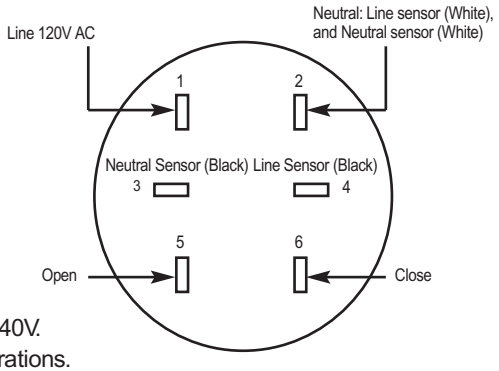


CURRENT SENSOR

The VARCOM 2600 Control is supplied ready to operate with Lindsey® CVMI or Fisher Pierce® 1301 overhead current sensors, which can be purchased separately. The sensor output must be 600A: 10V. If the current sensor is connected to a phase different than the Control supply voltage, refer to the software section of this manual (beginning on pg 18) to make phase adjustments.

Voltage sensing for the Control is pre-wired to use the supply voltage, typically 120 or 240V. Please consult the factory for other configurations.

SERIES 2600 CONTROLS



FUSING

All VARCOM Controls are supplied with a 15 Amp SLO-BLO® fuse, accessible from the front panel. This fuse protects the capacitor bank switches. If it was removed before installation, the fuse should be reinstalled after installation is complete.

An internal fuse that is not field replaceable protects the Control circuitry. All repairs should be referred to the factory.

MANUAL OPERATION

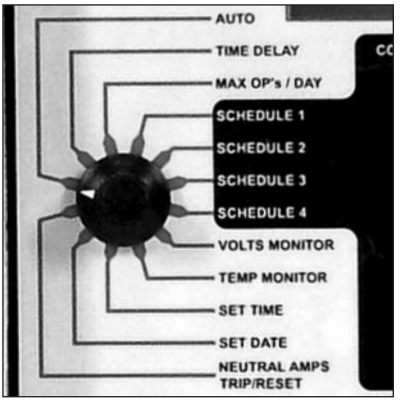
All VARCOM Controls can be used to operate the connected capacitor bank switches manually. To manually CLOSE or OPEN the capacitor bank using the Control front panel rocker switch:

1) Switch the Control out of the AUTO mode, verify that the red lamp is off, and select TIME DELAY. Using the ADJUST knob, select the desired time delay, in seconds, from 3 to 600. This will delay both manual and automatic operations by the time selected. The OPERATION PENDING light flashes before every open or close operation during the time delay period.

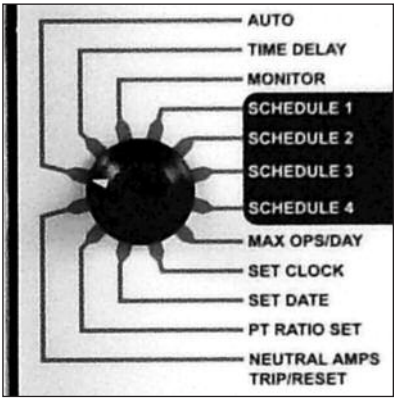
2) Use the MANUAL rocker switch to OPEN or CLOSE the capacitor bank switches. The OPERATION PENDING light will flash for the duration of the selected TIME DELAY. When the output is energized, the CLOSE or OPEN light will flash. Then, the output will de-energize and the light will remain on.

The capacitor bank cannot perform a close operation less than 5 minutes after a trip operation to allow time for the capacitors to discharge. If a CLOSE operation is attempted during this 5 minute time period, the Control will display 5MIN DLY and the Control will not close the bank.

Series 1600 Controls



Series 2600 Controls



NOTE: Manual operations are counted by the operations counter (close operations only), but manual operations do not count against the preset daily limit set by MAX OPS/DAY.

After completing the required manual operations, return the Control to AUTO for automatic operation. The AUTO light confirms Automatic operation.

NOTE: Pending manual operations can be canceled by turning the Control to AUTO. Similarly, pending automatic operations can be canceled by switching out of AUTO to any other switch position.

PROGRAMMING FOR AUTOMATIC OPERATION

Programming and set-up information for VARCOM Controls.

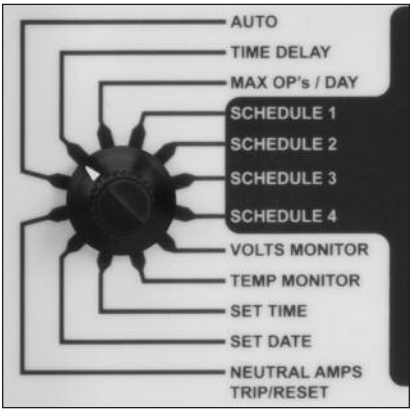
Settings Common to all Models

AUTO is the normal automatic operating mode for the Control. The display shows the operations counter, which cannot be reset. The operations counter counts all CLOSE operations.

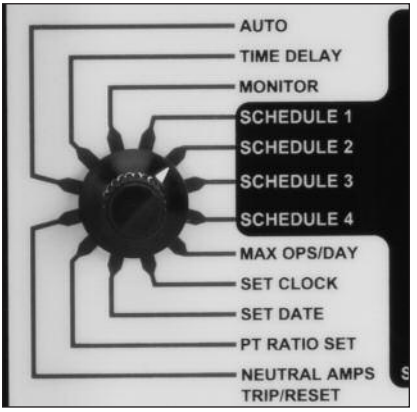
TIME DELAY sets the time delay, in seconds, for both manual and automatic operations. The delay can be set from 3 to 600 seconds in 3 second increments using the ADJUST switch. The OPERATION PENDING light flashes before every open or close operation during the entire time delay period.

MAX OP'S/DAY sets the maximum number of automatic capacitor bank CLOSE operations per rolling 24-hour period. This can be set from 2 to 24 operations using the ADJUST switch. This setting overrides all other time, temperature, current or voltage settings. If the daily operations limit is reached, the display will alternately show the operations counter and OP LIMIT while the Control is in AUTO mode. When MAX OPS is reached, the last operation will be an OPEN. Manual operations do not count against the limit set by MAX OPS/DAY.

Series 1600 Controls



Series 2600 Controls

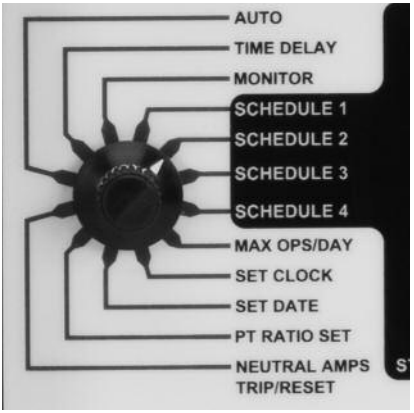


SETTING THE CONTROL MODE

The Model 1600 Control can allow voltage and/or temperature to override time settings. The Model 2600 Control can allow voltage to override temperature, time, amp and KVAR settings. Depending on the model, the following Control Modes can be used:

Control Mode	***Display Shows***
Time only	TIME
Time with voltage override	VOLT/TIM
Voltage only	VOLT
Time with temperature override	TMP/TIME
Temperature only	TEMP
Temperature with voltage override	VOLT/TMP
Time with voltage and temperature override	V/TMP/TI
Amps	LINE AMPS
Amps with voltage override	LINEAMP/V
KVAR	KVAR
KVAR with voltage override	KVAR/VOLT

Series 2600 Controls



SCHEDULE SETTINGS

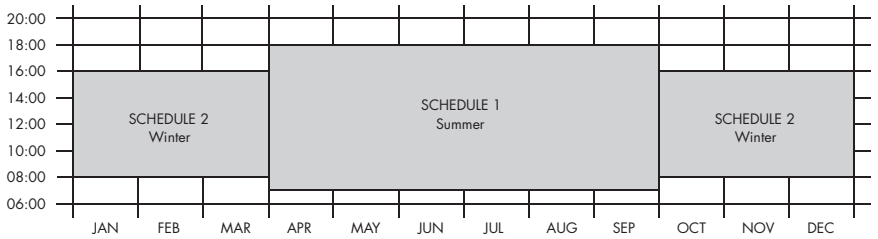
Four independent time schedules are available - SCHEDULE 1 through SCHEDULE 4. Each time schedule allows one OPEN and one CLOSE operation per day. The schedules can be used to set multiple OPEN and CLOSE operations for each day or they can be used for seasonal changes to the schedule, e.g. different OPEN and CLOSE times for summer and winter.

For each schedule selected, week days MON-FRI, weekend days SAT and SUN, and HOLIDAYS can be selected to be ACTIVE or OFF. ACTIVE days will follow the TIME ON and TIME OFF settings as well as any temperature or voltage override settings. OFF days will cause the capacitor bank to remain open.

The six standard holidays are New Years Day, Memorial Day, July 4th, Labor Day, Thanksgiving Day and Christmas Day. The VARCOM Controls allow a maximum of ten holidays to be programmed.

EXAMPLE 1 - SEASONAL VARIATION - Two time schedules are used for seasonal variation in the OPEN & CLOSE times and/or override settings (if any). TIME SCHEDULE 1 is a summer schedule with a START DATE of 4/1, a STOP DATE of 9/30, TIME ON at 07:00 and TIME OFF at 18:00 (all time settings are in 24 hour format). TIME SCHEDULE 2 is a winter schedule with a START DATE of 10/1, a STOP DATE of 3/31, TIME ON at 08:00 and TIME OFF at 16:00. For each time schedule, the days of the week, TIME ON, TIME OFF and override settings (if any) can be set independently.

Example 1



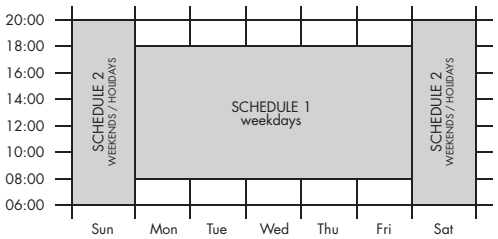
In this example, each schedule is ACTIVE for all days of the week and holidays and schedules 3 and 4 are not used. The CONTROL MODE is set for TIME, so voltage and temperature settings are not used.

To disable a time schedule, set the start date the same as the stop date. To make a schedule run year round, set the start date for 01/01 and the stop date for 12/31. In case of a conflict between time schedules, SCHEDULE 1 takes priority over SCHEDULE 2, SCHEDULE 2 over SCHEDULE 3, etc. In case of a conflict between temperature and voltage settings, voltage takes priority. To make a time schedule active for 24 hours, set TIME ON the same as TIME OFF.

EXAMPLE 2 - Time with Voltage Override - Two time schedules are used for year-round time and voltage control. SCHEDULE 1 is a weekday schedule for time with voltage override. Set the CONTROL MODE for VOLT/TIME (time with voltage override). The TIME ON is 08:00 and the TIME OFF is 18:00. Set MON-FRI to ACTIVE and set SAT, SUN and HOLIDAYS to OFF. The START DATE is 1/1 and the STOP DATE is 12/31.

The Control will anticipate voltage changes caused by opening and closing the capacitor bank. This may cause scheduled open or close operations to be deferred or delayed. See the Voltage Settings section (pg 10) for more information about Adaptive Trip.

Example 2



IMPORTANT! Time with voltage override means that voltage takes precedence. For these SCHEDULE 1 settings, the Control will close the bank at 08:00 only if the line voltage is below the OPEN VOLTS setting less the Adaptive Trip bias voltage. Conversely, the Control will open the bank at 18:00 only if the line voltage is above the CLOSE VOLTS setting plus the Adaptive Trip bias voltage. If the Control does not close the bank at the TIME ON setting or open the bank at the TIME OFF setting due to voltage conditions, it will open or close the bank later if the line voltage changes. The Control will also close the bank before the scheduled time of 08:00 if the line voltage drops below the CLOSE VOLTS setting.

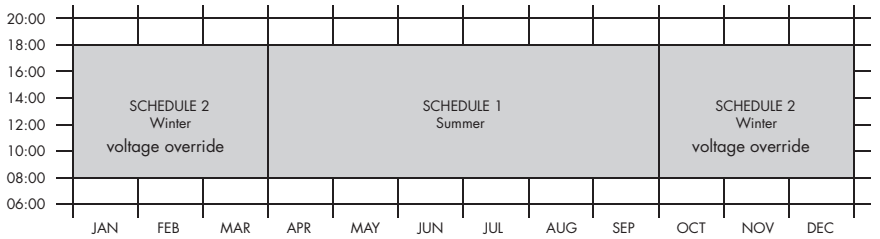
SCHEDULE 2 is a weekend schedule for voltage control only. Set the CONTROL MODE for VOLT (voltage control). For 24-hour control, set the TIME ON and TIME OFF to the same time. Set MON-FRI to OFF and SAT, SUN and HOLIDAYS to ACTIVE. Set the START DATE to 1/1 and the STOP DATE to 12/31. The Control will change from a weekday to a weekend schedule at midnight.

If 24-hour voltage control is not desired, the TIME ON and TIME OFF settings can be set as needed. The Control will close the bank at TIME ON only if the line voltage is below the OPEN VOLTS setting less the Adaptive Trip bias voltage. The Control will open the bank at TIME OFF independent of voltage.

EXAMPLE 3 - TIME WITH TEMPERATURE AND VOLTAGE OVERRIDE - Two time schedules are used for seasonal variations in temperature and voltage override settings.

SCHEDULE 1 is set for TEMP/TIME (time with temperature override) using the CONTROL MODE setting. This is a daily summer schedule so the START DATE is 4/1 and the STOP DATE is 9/30. The TIME ON is 08:00 and the TIME OFF is 18:00. The OPEN TEMP is 60°F and the CLOSE TEMP is 80°F. MON-FRI SAT, SUN and HOLIDAYS are all set to ACTIVE.

Example 3



IMPORTANT! Time with temperature override means that temperature takes precedence. For these SCHEDULE 1 settings, the Control will close the bank at 08:00 only if the temperature is above the OPEN TEMP setting of 60°F. Conversely, the Control will open the bank at 18:00 only if the temperature is below the CLOSE TEMP setting of 80°F. If the Control does not close the bank at the TIME ON setting or open the bank at the TIME OFF setting due to temperature conditions, it will open or close the bank when the temperature changes. The Control will also close the bank before the scheduled time of 08:00 if the temperature increases above the CLOSE TEMP setting.

SCHEDULE 2 is set for VOLT/TIME using the CONTROL MODE setting. This is the winter schedule so the START DATE is 10/l and the STOP DATE is 3/31. The TIME ON is 08:00 and the TIME OFF is 18:00 MON-FRI, SAT, SUN and HOLIDAYS are all set to ACTIVE. Voltage settings are set as needed.

OTHER SETTINGS

Besides the four independent time schedules, there are three other time settings to be entered. **DAYLIGHT SAVINGS** can be set to ACTIVE or OFF. Selecting ACTIVE automatically adjusts the internal clock and all time settings for daylight savings time in the spring and fall. Selecting OFF causes the Control to ignore daylight savings time changes.

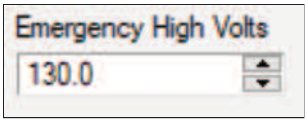
SET TIME and **SET DATE** are used only for initial set-up of the Control, or after the back up duration has been exceeded. The time is entered in 24 hr. format and manually adjusted in 5-minute increments. The date is entered as mm-dd-yy. [The first day in the year 2000 will be displayed as 1/1/00]. Reference the VARWARE software for setting the date and time.

Voltage Settings

OPEN VOLTS must be at least 3 volts above CLOSE VOLTS and cannot be set to any voltage difference less than 3 volts. The control voltage is measured and averaged over a 5-minute period to reject momentary spikes or sags. The Control will not respond to short-term voltage changes such as those caused by a sudden line voltage change or adjusting the control voltage with a variable transformer.

Voltage Controls also incorporate Adaptive Trip; the Controls are sensitive to the voltage rise caused by closing the capacitor bank. The voltage rise caused by closing the capacitor bank is averaged over the last 4 close operations and is used to anticipate the voltage change for the next close or open operation. This voltage change is used as a bias, and if the next close operation would cause the Control voltage to be above the open voltage set-point, the close operation is not performed until the voltage falls below the open voltage set point less the bias voltage. Similarly, if the next open operation would cause the Control voltage to be below the close voltage set point, the operation is not performed until the voltage rises above the close voltage set point plus the bias voltage. The initial factory default bias setting is 2 volts.

Line voltages above the Emergency High Volts setting will cause the control to open the capacitor switches without delay and the switches will remain open until the line voltage drops below this setting by at least the amount of the stored delta voltage. This setting is accessible only via the VARWARE software. The default setting is 130.0 and voltages of 130 or above will cause the control to open immediately. With a typical delta voltage of 2 volts, the control will not operate normally again until the voltage drops below 128 volts for at least several seconds. When the line voltage exceeds Emergency High Volts setting, the LCD will display EV OPEN ACTIVE until the line voltage is reduced.



Temperature Settings

OPEN TEMP cannot be set closer than 5°F above or below CLOSE TEMP. OPEN TEMP can be either higher or lower than CLOSE TEMP for summer or winter peaking loads. Temperature is measured and averaged over a 30 minute period so the Control will better respond to temperature sensitive VAR loading. The Control will not respond to short-term temperature changes such as those caused by spraying cold water on the temperature sensor.

KVAR settings

KVAR OPEN and KVAR CLOSE determine when the capacitor bank will open and close. The Control will display LD for leading KVAR and LG for lagging KVAR. KVAR CLOSE can only be set lagging and must be at least 20KVAR more than KVAR OPEN.

KVAR is measured and averaged over a five minute period to reject momentary transients. The KVAR settings also incorporate Adaptive Trip; the Control is sensitive to the change in KVAR caused by closing and opening the capacitor bank. The change in line KVAR caused by closing the capacitor bank is averaged over the last 4 close operations and is used to anticipate the change in KVAR caused by the next close or open operation. This change is used as a bias. If the next close or open operation will place the Control beyond the next KVAR set point, that operation is not performed until the line KVAR changes beyond the KVAR setting plus the bias. The initial factory default bias setting is 20 KVAR.

NOTE: The KVAR settings and the monitored line KVAR are both single phase values. For example, a typical 600kVAR capacitor bank will be 200KVAR/phase.

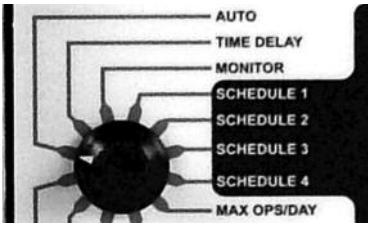
Reverse Power sets the action of the Control when reverse power flow is detected. Options are: IGNORE – to do nothing and leave the capacitor bank in its present state, VOLT – to revert to voltage control, or OPEN – to open the capacitor bank until normal power flow is restored.

EXAMPLE – KVAR with Voltage Override – The CONTROL MODE is set to KVAR/VOLT, for KVAR with Voltage Override. That is, the Control will follow the KVAR settings unless the voltage is outside of the voltage set points. The KVAR settings are set as follows: KVAR OPEN is LD 250 and KVAR CLOSE is LG 300. Voltage Override settings are set to VOLTS OPEN 128 and VOLTS CLOSE 122.0. The Control will open the bank, regardless of KVARS, if the control voltage exceeds 128V. The Control will close the bank, regardless of KVAR, if the control voltage falls below 122V.

IMPORTANT! The Control may not operate exactly at the above set points due to the Adaptive Trip feature described earlier. For example, the Control may not close at the KVAR CLOSE set point of LG 300 if doing so would raise the control voltage above the VOLTS OPEN set point of 128.5V. Similarly, the Control may not open the bank at the KVAR OPEN set point of LD 50 if doing so would lower the control voltage below the VOLTS CLOSE set point of 122V. Any operation that is deferred due to Adaptive Trip will take place as KVAR or voltage conditions change.

SYSTEM MONITORING

Depending on the model, the actual line voltage, ambient temperature or current can be monitored using the MONITOR settings. This can be helpful for setting up and checking Control operation. All parameters are measured and displayed real-time without any time delay or averaging.



LINE AMPS is the total current on the line, both real and reactive. AMPS REAC is the reactive component of the total line current. Reactive amps will be displayed along with LD for leading, LG for lagging, RV for reverse, and UN for unity power factor. Both LINE AMPS and AMPS REAC will show LOW AMPS in the display if less than 3 amps are measured. The AMPS REAC setting can be particularly helpful when adjusting the Amps Reactive set points for VAR Control. The effect of the capacitor bank on feeder VARs can also be seen by monitoring this setting while manually opening and closing the capacitor bank. AMPS THD% is the Total Harmonic Distortion in the line current. KVA is Kilo Volt Amperes.

KILOWATTS are the real component of the KVA. POWER FACTOR is displayed as a percentage of unity, e.g. 90% for a 0.9 power factor. To properly display KVA, KVAR and KW; the PT RATIO must be set. This is the ratio of the transformer supplying power to the Control. For example, the ratio for a 7200V line to ground connected transformer supplying 120V to the Control would be 60 (7200 / 120 = 60).

CONTROL VOLTS is the voltage used to power the Control, typically 120 or 240V. KV is the primary voltage in kilovolts and is derived from CONTROL VOLTS x PT RATIO. KV THD% is the Total Harmonic Distortion in the line voltage. POWER FLOW DIRECTION shows in the display as FORWARD or REVERSE. This will indicate a current sensor that is wired backwards.

NEUTRAL CURRENT MONITORING

On units equipped with optional Neutral Current monitoring, the capacitor bank neutral line is monitored. A neutral current sensor is mounted around the capacitor bank neutral lead and is connected to the Control. High neutral current is indicative of unbalanced VAR loading and can be used to trip the capacitor bank off line and keep it off line until the Control is manually reset. The neutral amps are averaged over five minutes when in AUTO mode. This average is used for comparison to the set point.

The NEUTRAL SENSE OPTION works in the following manner:

1. In MANUAL MODE, monitoring of neutral amps is accomplished by selecting VOLTS MONITOR, then toggling the ADJUST switch one position in either direction.

2. In AUTO MODE, monitoring of neutral amps is accomplished by toggling the ADJUST switch slowly until the display reads iA (Instantaneous Neutral Amps), and aA (5-minute Averaged Neutral Amps).

3. The neutral amps trip set point can be set from 3 to 100 amps. The setting below 3 amps will disable the neutral amp trip function. The display will read disabled.

4. In AUTO mode, if the neutral amps rise above the set point, the Control will open the capacitor bank, light the neutral trip LED, and hold the bank locked out until manually reset. Resetting the Control from neutral amp lockout is accomplished by rotating the MODE switch to the NEUTRAL AMPS, TRIP / RESET position.

CLOCK BACK-UP

The VARCOM Capacitor Control uses a capacitor back-up for maintaining the internal clock settings when Control power is interrupted. If power is interrupted to a Control for more than 10 days, the time settings may be lost. When this happens, the Control will alternately display TIME ERR when in the AUTO mode.

Only the internal clock is dependent on the capacitor back up. All other previously logged data, front panel settings and Control programming is stored in non-volatile memory, which retains is contents indefinitely without power.

The following information regarding the front panel displays may prove helpful in diagnosing a Control that appears to be functioning improperly.

LED INDICATORS

AUTO - Indicates the Control is in automatic mode. The Control will open and close the bank only per the programmed settings and the toggle switch is disabled. The display indicates the total number of CLOSE operations. When the LED is off, the Control is in manual mode and the toggle switch is enabled.

NEUTRAL AMPS TRIP / RESET - (Optional) - The capacitor bank neutral current has exceeded the preset threshold and the bank is locked OPEN. To reset this condition, rotate the MODE switch to the AMPS TRIP/RESET position.

SCADA ACTIVE - Indicates SCADA override of Control function when the control is in the Remote mode.

COM ACTIVE - Indicates communication has been received from the SCADA Master within a 5 minute timeout period.

OPERATION PENDING - Flashes during the number of seconds selected by TIME DELAY for every pending OPEN or CLOSE operation. CLOSE shows the bank status as closed. A flashing LED indicates the CLOSE output is energized. OPEN shows the bank status as open. A flashing LED indicates the OPEN output is energized.

CLOSE - Shows the bank status as closed. A flashing LED indicates the CLOSE output is energized.

OPEN - Shows the bank status as open. A flashing LED indicates the open output is energized.

LCD DISPLAY

COMBUSY - The Control is communicating via the communications port.

LOW LINE - The supply voltage has dropped below its operating threshold (92V for a 120V unit and 180V for a 240V unit). The Control will go into a standby mode until the voltage recovers and will then perform a power up self-check.

OP LIMIT - The Control has reached its daily limit of automatic close operations as set by MAX OPS/DAY. The Control will not CLOSE automatically again during the present 24 hour period. Manual CLOSE and OPEN operations can still be performed.

SYS ERR - The Control has detected a memory defect. The Control will stop operating and must be returned to the factory for repair.

TIME ERR - The Control has detected a timing error, most likely due to a discharged clock backup capacitor. This condition can be reset by resetting the time and date via the front panel or via the VARWARE software.

VOLT ERR - The voltage sensor is not operating properly or the voltage being measured has fallen either below 100V or above 150V. If this display is due to a short-term voltage change, the Control will reset automatically. While this condition persists, the Control will not perform any voltage related operations but will otherwise operate normally.

AMP ERR - The current sensor is not operating properly. If this is a transient condition, the Control will automatically reset the current sensor input and continue to operate properly. A permanent current sensor failure can be verified with the MONITOR - LINE AMPS setting which will show LOW AMPS. If this condition is permanent, the Control will not perform any VAR related operations but will otherwise operate normally.

5MIN DLY - Will be displayed for 5 minutes following any OPEN operation. The Control will not perform a CLOSE operation this period.

SPECIFICATIONS

Electrical

POWER REQUIREMENT: 100-140 or 200-260 VAC, 10W

MOUNTING: 4 or 6 Jaw Meter Socket or Pole Bracket with Amphenol connector.

OUTPUT CONTACTOR: 30A, 120/240 VAC. 15 second “on” duration for motor and solenoid operated switches.

FUSE: 15A SLO-BLO®

SURGE / LIGHTNING PROTECTION: ANSI C37.90.1 1989

OPERATING FREQUENCY: 60Hz (optional 50Hz availabe)

VOLTAGE ACCURACY: ±0.5 VAC, 0.1 VAC Resolution

LINE CURRENT ACCURACY: ±1% +5 counts, excludes line current sensor accuracy.

TEMPERATURE ACCURACY: ±1°F, 1°F Resolution

TIME ACCURACY: Temperature compensated oscillator, ±0.001%

CLOCK BACK-UP: Capacitor - 10 days

DISPLAY: Liquid Crystal

COMPUTER INTERFACE: USB

COMMUNICATIONS INTERFACE: Com 1: RS-232 serial interface for DNP 3.0

COMMUNICATION COM 2: RS-232 serial interface for local or remote PC interface

COMMUNICATIONS POWER SUPPLY: 12 VDC, 1 Amp

COMMUNICATION PROTOCOL: DNP 3.0

Mechanical

MOUNTING: 4 or 6 Jaw Meter Socket or Pole Bracket with Amphenol connector.

ENCLOSURE: NEMA 4X weather tight fiberglass; 8.75 x 10.75 x 5.5 in. (222mm x 273mm x 140mm) Hinged left, lock hasp on right side. Weight 8.5 lbs. (3.9 kg.)

Environmental

TEMPERATURE: -22°F to +185°F (-30°C to +85°C)

HUMIDITY: 5 - 95%, non-condensing

Repairs

If any damage is found please contact us at 800-435-0786 to arrange for service.

Settings

USER INTERFACE: Front panel user interface with visible access to all local control settings via rotary and rocker switches.

VOLTAGE: Close: 105 - 127 / 210 - 257 VAC; Max. setting = Open Volts -3 VAC.
Open: 108 - 130 / 213 - 260 VAC; Min. setting = Close Volts +3 VAC. 5-minute time averaged voltage response. Setting in 0.1 volt increments.

AMPS - CLOSE: 10 - 600

AMPS - OPEN: 5 - 300, no less than 5 amps less than Close amps.

KVAR - CLOSE: -10 to -2000

KVAR - OPEN: -280 to 1000, no less than 20 KVAR more leading than Close KVAR

TEMPERATURE: Close: 0 - 120°F;
Open: 0 - 120°F, no closer than 5°F to Close temperature.

TIME DELAY: 3 - 600 seconds, 3 second increments.

MAX OPERATIONS/DAY: Configurable from 2 - 24

MANUAL TRIP: Momentary Open or Close, Close and Open operations delayed by selected Time Delay, 5-minute delay following Open before re-close.

NEUTRAL AMPS TRIP: 3 - 100 Amps, harmonic filtered, 5-minute time average response, manual reset, 5-minute minimum tripped time

PT RATIO SET: 1 - 300

VARWARE PROGRAMMING AND DATA ANALYSIS SOFTWARE

Features

VARWARE® software aids in programming a VARCOM Capacitor Control for capacitor bank switching and power system monitoring via a computer.
The software includes the following features:

- Design capacitor bank control strategies in the office for future uploading to the Control.
- Create and save different Control strategies for different model Controls all with the same software.
- View and analyze data downloaded from Capacitor Controls. Examine Control switching operations, power outages and system parameters.
- Graph stored voltage, temperature and current data. Zoom in on areas of interest.
- Connect to a Control for real time monitoring of the Control parameters such as voltage, temperature and current.
- Download stored programs to update a Control strategy or download a Control program from a control back to a computer.
- Setup the Control for data logging. Program the Control to store control and system parameters such as switching operations, voltage and temperature.

PRECAUTIONS

Precautions must be taken before connecting a computer to an installed capacitor bank control.

CAUTION! Before connecting a computer to an installed capacitor bank take the following steps:

1. Ensure the Capacitor Control is properly grounded.
2. Set the Control so it is **not** at **AUTO or SET TIME**.

Failure to follow these precautions may result in damage to the computer, unexpected capacitor bank operation or personal injury.

SOFTWARE INSTALLATION

VARWARE software runs on Windows 10. The current version can be be downloaded from the HD Electric website. This software will communicate with the VARCOM Control via USB or Bluetooth.

Using the Software for the First Time

Start the software via the icon or use the Start button to navigate to the folder. Before connecting the computer to a Control, verify that the computer is set up for communications on the correct COM port. COM1 is the default port in the software. If necessary, change the port using the Communications drop-down menu.

IMPORTANT! If the COM port is changed, the software must be restarted for the change to take effect.

Create a Control Program

To program a Capacitor Control with a computer and software, a Control program must be created.

Select **File**, then **Open**. If this is the first time for setting up a program, select one of the default programs for the Control model that is to be programmed. For example, select 1600.ws for a VARCOM 1600 Control. A previously created file may also be selected. All setup files will have a **.ws** extension.

After the file is opened, the name of the file will be shown on the title bar of the main window.

NOTE that the VARCOM Control front panel ADJUST switch can be disabled in the main window by un-checking **Manual setpoint adjustment enabled**. This provides a level of security and prevents unwanted changes to the control program in the field.

Select a Schedule. Each time schedule must be programmed individually. To disable a schedule, set the start date the same as the stop date. To make a schedule active 24 hours per day for around the clock voltage control, set the start time the same as the stop time. The schedules in black lettering are active schedules, orange lettering refers to inactive schedules.

After entering all the desired settings, save the new file. Enter a file name and select **File**, then **Save**. The software automatically adds the **.ws** extension. If an existing setup file was modified, **Save As** must be selected so the original file is not overwritten.

To print the Active setup file, select File, then Print. To print another setup file, select File, then Open, then Print.

Upload a Setup Program to a VARCOM Control

To upload a setup program to a VARCOM Control, **follow the precautions shown at the beginning of the software section of this manual** (page 18) and connect a computer to the **Control**. Select **Communications**, then **Setup**, then **Send settings data to control** from the main menu.

Note that the name of the active setup file that will be uploaded to the VARCOM Control is shown in the upper left corner of the main title bar.

At this time, the current setup program can be downloaded from a VARCOM Control to a computer by selecting **Communications**, then Setup, then **Read settings data from control**.

Any time communications are initiated with a VARCOM Control, a warning will appear asking the user to verify that the Control is not in **Auto** or **Set Time**. While the setup data is being transferred, the LCD display on the VARCOM Control will display **COM BUSY.**

Edit Unit ID will give each Control a unique identification. The factory default ID is the serial number of the Control. This number is used in the header of all downloaded data and is also the default file name for the data file.

To set the clock on the Control, select **Communications, then Set Unit Clock**. The clock can be set according to the clock on the computer that is connected to the VARCOM Control. Alternately, the clock can be set manually with the front panel knobs.

USE PROFILE DATA LOGGING

Set up and use of the internal data logging features in a VARCOM Capacitor Control and download the stored data.

Initialize the Profile Data Collection Options

From the main menu, select **Communication** then **Profile**, then **Edit profile options**:

Sample Period sets the sample frequency for voltage and temperature data. All collected data are instantaneous readings and are not averaged or delayed.

Circular overwrite enabled will overwrite the oldest data when memory is full.

Record temperature enables temperature data recording.

Record neutral current enables neutral current data recording. This option is only available if the Control has the neutral sense feature enabled.

Select **Relay operations** to record data after an open or close operation. If selected, select a **Record delay** frequency from the drop-down box. A time delay is recommended to allow switching transients to settle.

When all desired options have been selected, select **OK** to update the Control. ***Updating Profile options erases any previously stored data in the Control.***

To download stored data, select Communications, then Profile, then Download profile data. The default file name is the Control ID# selected earlier (a .pro filename extension will be automatically added.) A different filename can also be entered at this time.

VIEW AND GRAPH DOWNLOADED PROFILE DATA

Review VARCOM Capacitor Control switching operations and system power outages, or graph collected system data such as voltage, temperature and current.

View Profile Data Files

Select **View Data** from the main menu, then **View Profile Data.**

Select from the available profile files.

The stored data will be shown as a file of data points. A new header with a record number is generated every time power is restored, every day just after midnight, following a manual adjustment of the time clock, or whenever the Control performs a switching operation.

Power outage duration can be determined by the time difference between the last recorded data point and the time that power is restored.

The data file also displays the status of the Control, the MODE (AUTO or MANUAL), the STATE of the bank (OPEN or CLOSED), the OPERATION occurring, or the reason for the last Control operation (TIME, VOLTAGE, TEMPERATURE, etc.).

To print a copy of this file, select File, then Print.

Graph Profile Data Files

Any stored system parameter such as voltage and temperature can be graphed. Select **View Data**, then **Graph Profile Data** and choose the desired data file.

Select the data to be shown on the graph. The proper graphing options will be enabled for the appropriate control model.

To print a graph, select **Files**, then **Print.**

Modify Profile Graphs

To zoom in on a particular set of data points, click and drag the mouse around the area to be zoomed. Release to complete the selection.

Zooming can also be accomplished by selecting **Chart**, then **Zoom**.
Select the appropriate zoom function.

Clicking the right mouse button anywhere on the graph will also access the zoom function via a pop-up menu.

Using the **Zoom In** or **Zoom Out** functions will zoom in or out referenced from the center of the graph. **Full View** displays the entire graph.

GRID LINES: Toggles the display of grid lines on and off.

EXPORT: Allows the graph to be exported to a specified file or copied to the clipboard.

MOUSE CLICK ACTION, ZOOM IN: With this option enabled, double clicking on the graph area will zoom in.

MOUSE CLICK ACTION, ZOOM OUT: With this option enabled, double clicking on the graph area will zoom out.

MOUSE CLICK ACTION, NONE: With this option enabled, double clicking will have no effect.

SHOW DATA HINT: Displays a popup window with details of the closest data point.

TABLE, SHOW TABLE: Displays a data table at the bottom of the graph window.

DATA OPTIONS: Changes the data that is displayed on the graph.

MARK POINTS: Places a point at each data point on the graph.

TITLE: Changes the title of the current graph.

REAL TIME MONITORING OF THE VARCOM CAPACITOR CONTROL

Connect a computer to the Control for real time monitoring of the Control. **Follow the precautions shown at the beginning of the software section of this manual** (page 18) and connect a computer to the Control.

Information will be displayed depending on the Control model currently connected. All displayed values will be updated continuously until the Communications Monitor window is closed.

TERMS AND CONDITIONS OF SALE

HD Electric Company is herein referred to either as "HDE" or "Seller" and the customer or person or entity purchasing goods or services (hereinafter collectively referred to as "Goods") is referred to as the "Buyer". These Terms and Conditions, any price list or schedule, quotation, acknowledgment or invoice from HDE relevant to the sale of the Goods and all documents incorporated by specific reference therein, constitute the complete and exclusive statement of the terms of the agreement governing the sale of Goods by HDE to Buyer. Buyer's acceptance of the Goods will manifest Buyer's assent to these terms and conditions without variation or addition. Any different or additional terms in Buyer's purchase order or other Buyer documents are hereby objected to. HDE reserves the right in its sole discretion to refuse orders.

1. PRICES AND TAXES: Unless a fixed price is quoted, the price at which this order is accepted is subject to adjustment to HDE's price in effect at the time of order. Any current or future tax or governmental charge (or increase in same) affecting Seller's costs or production, sale or delivery or which Seller is otherwise required to pay or collect in connection with the sale, purchase, delivery, storage, processing, use or consumption of Goods (but excluding any tax on Seller's net income or profit) shall be for Buyer's account and shall be added to the price.

2. TERMS OF PAYMENT: Terms are stated on HDE's invoice in U.S. currency. HDE shall have the right, among other remedies, either to terminate this agreement or to suspend further performance under this and/or other agreements with the Buyer in the event Buyer fails to make any payment when due, which other agreements Buyer and Seller hereby amend accordingly, or HDE otherwise deems itself insecure. Buyer shall be liable for all expenses, including attorneys' fees, relating to the collection of past due amounts. Should Buyer's financial responsibility become unsatisfactory to HDE, cash payments or security satisfactory to HDE may be required by HDE for future deliveries and for the goods theretofore delivered. If such cash payment or security is not provided, in addition to HDE's other rights and remedies, HDE may discontinue deliveries. HDE may apply a finance charge for payments made by credit card.

3. SHIPMENT AND DELIVERY: Unless otherwise expressly provided, shipments are made F.O.B. HDE's shipping point. Risk of loss or damage and responsibility shall pass from HDE to Buyer upon delivery to and receipt by common carrier. Any claims for shortages or damages suffered in transit are the responsibility of Buyer and shall be submitted by the Buyer directly to the carrier. Shortages or damages must be acknowledged and signed for at the time of delivery. While HDE will use all reasonable commercial efforts to maintain the delivery date(s) acknowledged or quoted by HDE, all shipping dates are approximate and not guaranteed. HDE reserves the right to make partial shipments. HDE, at its option, shall not be bound to tender delivery of any Goods for which Buyer has not provided shipping instructions. If the shipment of the Goods is postponed or delayed by Buyer for any reason, Buyer agrees to reimburse HDE for any and all handling and storage costs and other additional expenses resulting therefrom. All claims for shipping errors, lost shipments or any other discrepancies must be made within ninety (90) days or they will be disallowed and deemed waived.

4. HDE LIMITED WARRANTY: HDE covers its products with a manufacturer's warranty against defects in material or workmanship for a period of ten years in the case of Capacitor Controls and in all other circumstances for a period of one year, unless otherwise stated by HDE in writing. To take advantage of this warranty, the complete product must be delivered prepaid to HDE or any HDE Authorized Service Center. This warranty shall not apply to any Goods including but not limited to products which: (a) Have been repaired or altered outside HDE's factory (or Authorized Service Center) or in any manner so as, in HDE's judgment, to affect its serviceability or proper operation; (b) Have been subjected by persons other than HDE (or Authorized Service Center) to improper handling, operation, maintenance, repair or alteration; and, (c) Have been subjected to normal wear and tear, misuse, negligence, improper installation or accident. HDE's obligation under this warranty, and the Buyer's exclusive remedy for the breach thereof, shall be limited to, at HDE's option, repair or replacement of any allegedly defective Goods or issuance of credit. HDE requires the return of any allegedly defective Goods, transportation prepaid, before honoring any claim. All returned Goods are subject to inspection, and if examination does not disclose any defect covered by this warranty, replacement of such Goods or issuance of credit for same will not be approved. THE FOREGOING CONSTITUTES HDE'S SOLE WARRANTY RESPONSIBILITY AND BUYER'S EXCLUSIVE REMEDY WHETHER SOUNDING IN TORT, CONTRACT, STRICT LIABILITY OR OTHERWISE, EXCEPT AS OTHERWISE EXPRESSLY SET FORTH IN THIS AGREEMENT. THERE ARE NO OTHER WARRANTIES, EXPRESS OR IMPLIED, WHETHER OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR OTHERWISE. No employee, agent, dealer, or other person is authorized to give any warranty on behalf of HDE. This warranty extends only to persons or organizations who purchase the Goods from HDE for resale.

5. LIMITATION OF REMEDY AND LIABILITY: THE SOLE AND EXCLUSIVE REMEDY FOR BREACH OF ANY WARRANTY HEREUNDER SHALL BE LIMITED TO REPAIR, CORRECTION, REPLACEMENT OR CREDIT UNDER SECTION 4. HDE SHALL NOT BE LIABLE FOR DAMAGES CAUSED BY DELAY IN PERFORMANCE, AND IN NO EVENT, REGARDLESS OF THE FORM OF THE CLAIM OR CAUSE OF ACTION (WHETHER BASED IN CONTRACT, INFRINGEMENT, NEGLIGENCE, STRICT LIABILITY, OTHER TORT OR OTHERWISE), SHALL HDE'S LIABILITY TO BUYER AND/OR ITS CUSTOMERS EXCEED THE PRICE PAID BY BUYER FOR THE SPECIFIC GOODS GIVING RISE TO THE CLAIM OR CAUSE OF ACTION, AND BUYER SHALL INDEMNIFY HDE FOR ANY DAMAGES IN EXCESS THEREOF. BUYER AGREES THAT IN NO EVENT SHALL HDE'S LIABILITY TO BUYER AND/OR ITS CUSTOMERS INCLUDE SPECIAL, INDIRECT, INCIDENTAL, CONSEQUENTIAL OR PUNITIVE DAMAGES OF ANY CHARACTER IN CONNECTION WITH THE SALE, RESALE OR USE OF THE GOODS, WHICH ARE WAIVED BY BUYER AND AS TO WHICH BUYER SHALL INDEMNIFY HDE. The term "consequential damages" shall include, but not be limited to, loss of anticipated profits, business interruption, loss of use of revenue, cost of capital or loss of or damage to property, equipment, or data, or loss of reputation. Further, Buyer shall indemnify and hold HDE harmless from any liability to Buyer, Buyer's employees, workers, contractors or any other persons arising out of Buyer's, and any other persons', use of the Goods. All instructions and warnings supplied by HDE will be passed on to those persons who use the Goods. HDE's Goods are to be used in their recommended applications and all warning labels adhered to the Goods by HDE shall be left intact. It is impossible to eliminate all risks associated with the use of the Goods. Risks of serious injury or death, including risks associated with electrocution, arcing and thermal burns, are inherent in work in and around energized electrical systems. Such risks arise from the wide variety of electrical systems and equipment to which Goods may be applied, the manner of use or application, weather and environmental conditions or other unknown factors, all of which are beyond the control of HDE. HDE does not agree to be an insurer of these risks, and shall have no liability for any claims arising from such risks. WHEN YOU BUY OR USE THESE PRODUCTS, YOU AGREE TO ACCEPT THESE RISKS.

6. EXCUSE OF PERFORMANCE (FORCE MAJEURE): HDE shall not be liable for delays in performance or for non-performance due to acts of God; acts of Buyer; war; fire; flood; weather; sabotage; strikes, labor disputes, civil disturbances or riots; governmental requests, restrictions, allocations, laws, regulations, orders or actions; unavailability of or delays in transportation; default of suppliers; or unforeseen circumstances or events beyond HDE's reasonable control. Deliveries or other performance may be suspended for an appropriate period or cancelled by HDE upon notice to Buyer in the event of any of the foregoing, but the balance of this agreement shall otherwise remain unaffected. If HDE determines that its ability to supply the total demand for the Goods, or to obtain material used directly or indirectly in the manufacture of the Goods, is hindered, limited or made impracticable due to causes set forth herein, HDE may allocate its available supply of the Goods or such material (without obligation to acquire other supplies of any such Goods or materials) among itself and its purchasers on such basis as HDE determines to be equitable without liability for any failure of performance which may result therefrom.

7. CHANGES: HDE reserves the right to change designs and specifications for standard Goods without prior notice to Buyer, but not with respect to custom Goods being made for Buyer. HDE shall have no obligation to install or make such change in any Goods manufactured prior to the date of such change.

8. ASSIGNMENT: Buyer shall not assign its rights or delegate its duties hereunder or any interest herein without the prior written consent of HDE, and any such assignment, without such consent, shall be void.

9. INSTALLATION: Buyer shall be responsible for receiving, inspecting, testing, storing, installing, starting up and maintaining all Goods.

10. INSPECTION/TESTING: Buyer, at its expense, agrees that it will promptly inspect the Goods upon receipt thereof, and in no event later than thirty (30) days from the date of receipt of the Goods. Buyer shall deliver to HDE within fifteen (15) days of inspection, but in no event later than forty-five (45) days from the date of receipt of the Goods, written notice of any and all deficiencies, defects, variations from specifications or complaints of any kind with respect to the quantity, quality, condition, shipment, performance, price or appearance of the Goods so received by Buyer. In the event no such written notice is received by HDE, Buyer shall be deemed conclusively to have inspected and accepted all such Goods unconditionally and to have waived any and all rights and claims, including without limitation any right to reject the Goods or to claim damages in respect thereof. Buyer may not return goods without first advising HDE of the reasons therefore, obtaining from HDE a material authorization number and observing such instructions as HDE may give in authorizing such return. In the event a return is authorized by HDE, a restocking for any Goods requiring repackaging or maintenance a twenty percent (20%) restocking fee shall be assessed to Buyer in the final credit amount.

11. SERVICES: If this agreement requires HDE to perform or provide any services, HDE (including without limitation its successors, assigns, agents or any person or entity acting at HDE's direction) shall not be responsible for any damages, claims, liabilities or expenses of any nature arising out of such services.

12. U.S. EXPORT CONTROL LAWS: All Goods sold to Buyer by HDE hereunder are subject to U.S. Export Control Laws. Buyer hereby agrees not to re-sell or divert any goods contrary to such laws.

13. COMPLIANCE: Seller/Contractor shall comply with all applicable federal, state or local laws, rules, regulations, or orders. Seller/Contractor shall comply with Executive Order 11246, as amended by Executive Order 11375, and the applicable provisions of the Office of Federal Contract Compliance Programs (OFCCP), 41 CFR Part 60, which are incorporated herein by this reference. Buyer shall comply with all applicable federal, state, or local laws, rules, regulations or orders including but not limited to the Foreign Corrupt Practices Act of 1977, as amended. HDE reserves the right to delay or refuse delivery if requests for reasonable assurances of Buyer's compliance are not tendered as requested.

14. MISCELLANEOUS: These terms and conditions supersede all other communications, negotiations and prior oral or written statements regarding the subject matter hereof. No change, modification, rescission, discharge, abandonment, or waiver of these terms and conditions shall be binding upon HDE unless made in writing and signed on its behalf by its duly authorized representative. No conditions, usage or trade, course of dealing or performance, understanding or agreement purporting to modify, vary, explain, or supplement these terms and conditions shall be binding unless hereafter made in writing and signed by Seller. No modification shall be effected by HDE's receipt or acceptance of Buyer's purchase orders, shipping instruction forms, of other documentation containing terms at variance with or in addition to those set forth herein, all of which are objected to by HDE. Any such modifications or additional terms are specifically rejected by HDE. No waiver by HDE with respect to any breach or default of any right or remedy and no course of dealing, shall be deemed to constitute a continuing waiver of any other breach or default of any other right or remedy, unless such waiver be expressed in writing and signed by HDE. All typographical or clerical errors made by HDE in any quotation, acknowledgment or publication are subject to correction. Validity and performance relating to the interpretation and effect of this agreement shall be governed by the laws of the state of Illinois without regard to its conflict of law principles.

15. DISPUTE RESOLUTION: In the event of any dispute INCLUDING, BUT NOT LIMITED TO, BREACH OF CONTRACT, BREACH OF WARRANTY, CLAIMS BASED IN TORT, NEGLIGENCE, PRODUCT LIABILITY, FRAUD, MARKETING, STATE OR FEDERAL REGULATIONS, ANY CLAIMS REGARDING THE ENFORCEABILITY OF THIS LIMITED WARRANTY, AND THE WAIVER OF CLASS ACTION TRIALS between Buyer and Seller, either may choose to resolve the dispute by binding arbitration, as described below, instead of in court. THIS MEANS IF EITHER BUYER OR SELLER CHOOSE BINDING ARBITRATION, NEITHER PARTY SHALL HAVE THE RIGHT TO LITIGATE SUCH CLAIM IN COURT OR HAVE A JURY TRIAL. DISCOVERY AND APPEAL RIGHTS ARE LIMITED IN BINDING ARBITRATION. Buyer and Seller agree that the proper venue if Arbitration is not so chosen by Buyer or Seller of all actions arising in connection herewith shall be only in the state of Illinois and the parties agree to submit to such jurisdiction. No action, regardless of form, arising out of transactions relating to the agreement, may be brought by either party more than two (2) years after the cause of action has accrued. The U.N. Convention on Contracts for the International Sales of Goods shall not apply to this agreement.

16. CLASS ACTION WAIVER: BINDING ARBITRATION MUST BE ON AN INDIVIDUAL BASIS. THIS MEANS NEITHER BUYER NOR SELLER MAY JOIN OR CONSOLIDATE CLAIMS IN ARBITRATION BY OR AGAINST OTHERS, OR LITIGATE IN COURT OR ARBITRATE ANY CLAIMS AS A REPRESENTATIVE OR MEMBER OF A CLASS OR IN A PRIVATE ATTORNEY GENERAL CAPACITY. ADMINISTRATION OF ARBITRATION: The binding arbitration must be administered by the American Arbitration Association ("AAA") in accordance with its Commercial Arbitration Rules and/or Supplementary Procedures for Consumer-Related Disputes (including proceedings to mitigate costs of travel). This binding arbitration is governed by the Federal Arbitration Act ("FAA") (9 USC §1, et. seq.) and will govern the interpretation and enforcement. The binding arbitration shall be held at a location determined by AAA or at such other location as mutually agreed. In addition to the terms stated above, the following will apply to the binding arbitration: (1) the arbitrator, and not any federal, state, or local court or agency, will have exclusive authority to resolve any dispute relating to the interpretation, applicability, enforceability or formation of this Agreement including any claim that all or any part of this Agreement is void or voidable; (2) the arbitrator shall apply Illinois law consistent with the FAA.

HD Electric Company is committed to ongoing review and improvement of its product lines, and thus reserves the right to modify product design and specifications without notice.

HD Electric Company® products are available through HDE® sales representatives worldwide. HD Electric products receive final assembly and shipment from HDE's production facility at Suite 400 - 4320 Executive Drive, Southaven, MS 38672.

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