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**REMOTE
COMMUNICATION
SYSTEM
VERSION 3.0
USER MANUAL**

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PM301 REV 2 10/03/01

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Manual abstract:

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0 1. Introduction This section is intended version 3.0 of the Communication Interface Module (CIM). For other product versions, contact Thomson Technology, Inc. to obtain applicable instruction manuals. The Thomson Technology (TTI) remote communication system with the CIM 3.0 and Modbus™ protocol provides remote monitoring and control of TTI microprocessor-based controllers as used in the power generation industry. The system consists of 2 main components as follows: · Communication Interface Module (CIM): The CIM provides the hardware and software interface between a Modbus compliant device (customer supplied) and the specific microprocessor-based controllers as used at a generator site. · Remote Terminal Unit (RTU): An RTU is a device that directly operates the equipment at a generator site. These devices are the actual microprocessor-based controllers as developed by Thomson Technology, Inc.

(e.g. MEC 20 engine controller or TSC 800 transfer switch controller. The following diagram depicts a typical remote communication system. CIM MICROPROCESSOR ENGINE CONTROLLER MEC 20 ALARM SHUTDOWN MEC 20 SILENCE PREVIOUS DECREMENT READY SPEED SIGNAL RESET INCREMENT NEXT EXIT LAMP TEST ENTER RUN OFF AUTO LOAD TEST EMERGENCY STOP TO MODBUS COMPLIANT DEVICE OR RS 485 NETWORK ENGINE GEN RTU Site G:ENGINEERPRODUCTS\NCS\HOST.

VSD PM055 Rev 2 00/08/31 1 Thomson Technology SECTION 1 COMMUNICATION INTERFACE MODULE Some advanced features of the remote communication system with the CIM 3.0 module and Modbus™ protocol are as follows: · · · One CIM module can control and monitor up to 10 RTUs at a

generator site using a single direct serial/phone link. Configuration of all communication system setpoints is done using software. CIM Port #2 can be configured for RS-232, RS-422 or RS-485 serial communication types. RS-485 communication allows multiple CIM's to be interconnected to any Modbus™ RS-485 network.

RS-485 is recommended for the best distance and noise immunity. Port #2 has a hardware protocol described as follows: . . . Power: This LED is illuminated whenever the CIM has correct DC supply voltage applied. Service: This LED illuminates when the CIM has an internal fault in which the unit must require service. DC Fault: This LED is illuminated whenever the CIM's internal power supply has shutdown do an internal fault or an external overvoltage condition from the DC supply input. To reset a DC fault, the DC supply voltage must be removed for 30 seconds, then re-applied. 3.4. Internal Modem: The CIM is provided with an internal 14.4 Kbaud modem. The modem is internally connected between the telephone port and port 2A/B.

3.5. Port 2B: Port 2B may be interconnected to a remote terminal unit (RTU) or Personal computer (PC). Port 2B can be configured to RS-232 or RS485/-422 type transmission signal. When a personal computer is connected to Port 2B, a null modem cable or connector must be used. When the CIM modules' internal modem is used, port 2B is disabled. This port uses an 8 pin RJ45 plug-in connector. An LED indicator is provided to signal when the port is communicating.

Port 2B is internally wired in parallel with Port 2A. 3.

6. Port 2A: Port 2A may be interconnected to a remote terminal unit (RTU) or PC. Port 2A can be configured to RS-232 or RS-485/-422 type transmission signal. When a personal computer is connected to Port 2A, a null modem cable or connector must be used in series with the PC cable. When the CIM modules' internal modem is used, port 2A is disabled.

This port uses a 9 pin standard DB9 female plug-in connector. PM055 Rev 2 00/08/31 4 Thomson Technology SECTION 1 COMMUNICATION INTERFACE MODULE An LED indicator is provided to signal when the port is Transmitting. Port 2A is internally wired in parallel with Port 2B. 3.7.

Port 3B: This port may be interconnected to a remote terminal unit (RTU). Port 3B utilizes a RS-422 type transmission signal that is compatible with MEC 20 or TSC 800 controllers. The standard connection for a MEC 20 or TSC 800 controller (RTU) application is for port 3B to be connected to the RTU.



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This port uses an 8 pin RJ45 plug-in connector and allows for a direct connection to TTI MEC 20 and/or TSC 800 controllers. Port 3B is internally wired in parallel with Port 3A. 3.8. Port 3A. This port may be interconnected to a remote terminal unit (RTU) or directly to a PC. Port 3A utilizes a RS-422 type transmission signal that is compatible with MEC 20 or TSC 800 controllers.

The standard connection for a MEC 20 or TSC 800 controller (RTU) application is for port 3A to be connected to the RTU. This port uses a 9 pin DB9 female connector. Port 3A is internally wired in parallel with Port 3B. NOTE: CIM Port 2 cannot be used concurrently with the modem (CIM Port 1). An RS232 or RS-422 cable can be connected to the CIM, but cannot be active if the modem is to be used. An RS-485 connection will effectively disable the modem whether it is active or inactive. PM055 Rev 2 00/08/31 5 Thomson Technology SECTION 1 COMMUNICATION INTERFACE MODULE 4. Telephone Port 1 Detail pin numbers and usage designations for the telephone port are as follows: Signal Type - Telephone No Connection No Connection TIP Ring No Connection No Connection Direction No Connection No Connection Input/output Input/output No Connection No Connection 1 2 3 4 5 6 Port 1A RJ11 # 5. Port 2A/B Detail pin numbers and usage designations for Port number 2A/B are as follows: RS-485 half-duplex (Pending) Sa' Sb' Sb Sa Ground NC NC NC RS-422 full-duplex (Pending) Rxa Rxb Txb Txa Ground NC NC NC RS-232 (DTE) CD Rx Tx DTR GND DSR RTS CTS RI Direction RJ45 # DB9 # Input Input Output Output Passive Input Output Input n/c 1 2 3 4 5 6 7 8 n/a 1 2 3 4 5 6 7 8 9 PM055 Rev 2 00/08/31 6 Thomson Technology SECTION 1 COMMUNICATION INTERFACE MODULE 6. Port 3A/B Detail pin numbers and usage designations for Port number 3A/B are as follows: RS-485 half-duplex (Pending) Sa Sb Sb' Sa' Ground NC NC NC RS-422 full-duplex (Pending) Txa Txb Rxb Rxa Ground NC NC NC RS-232 (DCE) CD Tx Rx DSR GND DTR CTS RTS RI Direction RJ45 # DB9 # Output Output Input Input Passive Output Input Output n/c 1 2 3 4 5 6 7 8 n/a 1 2 3 4 5 6 7 8 9 7.

CIM Operation Functions The CIM module provides the following main functions when used in a communication system: RTU & Modbus™ Device Interface: The CIM is the main communication interface component between a Modbus™ compliant device and the remote terminal units. The CIM provides the necessary hardware interface (i.e. COM Ports) as well as the Modbus™ software protocol interface. Protocol Data Processing: The CIM receives incoming communication signals from various types of RTUs and processes the data into the specific Modbus™ language as required for the application. The processed data then gets transferred to the applicable port and transmitted to a remote Modbus™ compliant device. CIM Configuration: The CIM stores vital information in non-volatile FLASH memory pertaining to a specific RTU site as defined by the user. Stored information includes, site name, site passwords, and auto callout phone numbers (3). RTU Polling: The CIM module will automatically poll connected RTUs to determine their operating status and to signal an auto callout (callout is only operational when the modem feature is operational) to the remote Modbus™ compliant device to alert a user of an abnormal condition. PM055 Rev 2 00/08/31 7 Thomson Technology SECTION 1 COMMUNICATION INTERFACE MODULE 8.

CIM Block Diagram + 8-35Vdc Battery Voltage EMI/RFI FILTER POWER SUPPLY DC Power to all IC's MICROPROCESSOR (CORE) DIAGNOSTIC LED's Telephone Port 1 RJ11 14.4kb Internal Modem Channel Select Logic Port 2 or Modem Telephone Line 2A DB9 Modbus (TM) Compliant Device PORT 2 DRIVER RS232/485 NOTE: The Modem is disabled when an active Port 2 connection is made. 2B RJ45 Alternate Port Connections DB9 DUART 3A PORT 3 DRIVER RS232/485 3B RJ45 MEC 20/ TSC 800 G:/R&D/PRODUCTS/ICS/DESIGN/CIM/1029012.VSD Rev. 0 99-08-26 9. CIM Specifications Power supply: 8 to 35Vdc, negative ground Power consumption: 5 watts (max.) Operating temperature: -15(C to +50(C Storage temperature: -40(C to +85(C Environmental: NEMA 1 Vibration: 1g, 5-250Hz Humidity: 5 to 95% non-condensing Dimensions: 150mm W x 180mm H x 50mm D Internal Modem 14.4 kbaud, Hayes™ AT set compatible Communication Ports Hardware Port 1 Telephone T/R Port 2 RS-232/-422/485 asynch., 1200-19200 baud Port 3 RS-422, asynchronous 4800 baud Communication Ports Software Protocol Port 1 Telephone Port 2 Modbus™ Protocol Port 3 TTI T-Net Protocol Specifications subject to change without notice. PM055 Rev 2 00/08/31 8 Thomson Technology SECTION 1 COMMUNICATION INTERFACE MODULE 10.

CIM Installation NOTE: Installations should be done according to all applicable electrical regulation codes as required. The following installation guidelines are provided for general information only pertaining to typical site installations. For specific site installation information, consult Thomson Technology as required. CAUTION!!! Qualified personnel must do all installation and/or service work performed only. Failure to do so may cause personal injury or death.

10.1. Battery Supply Input The CIM can operate on any battery supply from 8 to 35 volts DC nominal Wiring from the system battery to the CIM should conform to the following guidelines to avoid possible communication module malfunction and/or damage. Avoid wiring from the engine starter terminals - wiring should go directly from the battery terminals to the control panel where the CIM module is located (to avoid voltage drop in the starter cables and starter motor commutation noise). CAUTION!!! The battery charger must be turned off before battery cables are removed from the battery (i.e. for servicing). Failure to do so may subject the control panel to an overvoltage condition in which damage may result. Under noisy environments (i.e. gas engines with high voltage ignitions, etc.), wiring from battery should be a twisted pair of #14 AWG (2.5mm²) wires. The use of AC or DC operated solenoids or relays in control systems can sometimes cause high voltage spikes on the DC power supply, which may cause electronic devices to fail. Transient suppression devices are recommended for all inductive devices sharing wiring or if physically located near the CIM module.

For DC operated relays or solenoids, use a suitably rated counter EMF Diode (or commonly known as "freewheeling" diode). For AC operated relays or solenoids, use a suitably rated metal oxide varistor (MOV) or capacitor/resistor suppressor. PM055 Rev 2 00/08/31 9 Thomson Technology SECTION 1 10.2. COMMUNICATION INTERFACE MODULE Remote Communication Wiring All communication interconnecting wiring to/from the CIM Module shall utilize #22 AWG-8 wire, twisted, shielded cable with RJ45 connectors.



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All remote communication wiring outside the control panel must be run in separate conduit and shall not be located near AC power cables to prevent pick-up of induced voltages. 10.3. Dielectric Testing Do not perform any high voltage dielectric testing on the CIM connected in the circuit as serious damage will occur to the module. 10.

4. Mounting Location/Installation The CIM Module is designed for mounting directly onto a control panel inner sub-panel. Considerations should be given for the following: The controller should be installed in a dirt free, dry location away from extreme heat sources. Adequate space should be provided around the CIM module for control wiring. 10.5. Mounting Dimensions The CIM mounting dimensions are shown in the following diagram: 150 mm 190 mm 95mm 95 mm 200mm 4 HOLES Ø 4.77mm. (.188 in.

) 54.5mm 109mm 54.5mm DRAWING SCALE: .6:1 G:/R&D/PRODUCTS/ICS/DESIGN/CIM/102910.VSD Rev.

1 98-12-04 ENCLOSURE DEPTH: 50mm PM055 Rev 2 00/08/31 10 Thomson Technology SECTION 1 10.6. COMMUNICATION INTERFACE MODULE RS-232 and RS-485/422 Wiring This section describes the cabling necessary to connect a host PC to a CIM using RS-232 and to connect to an RS-485 or RS-422 network 10.6.1.

Host PC Connection The host PC connection to the CIM requires a null-modem adapter, as both devices believe they are DTE. 10.6.1.1. Host PC DB-25 To CIM DB-9 DTE GND TXD RXD RTS CTS DSR, DCD SG DTR 10.6.1.2. DB-25 1 2 3 4 5 6,8 7 20 DB-9 n/c 2 3 8 7 4 5 6,1 CIM GND RXD TXD CTS RTS DTR SG DSR,DCD Host PC DB-9 To CIM DB-9 DTE TXD RXD RTS CTS DSR, DCD SG DTR DB-9 3 2 4 7 8 1,6 5 4 DB-9 2 3 8 7 4 5 6,1 CIM RXD TXD CTS RTS DTR SG DSR,DCD PM055 Rev 2 00/08/31 11 Thomson Technology SECTION 1 COMMUNICATION INTERFACE MODULE 10.

6.2. RS-485/-422 Connection The following hardware configuration is required for 4 wire RS485/-422 from the port 2 on the CIM to an RS-232 port on a computer: The following parts are connected in order from the RS-232 side (computer) to the RS-485/-422 side (the CIM). RS-232 to RS-485 or RS-422 adapter (set to DCE) DB-25 to RJ45 adapter (or custom cable) for RS-422/-485 on the CIM port 2(see below wiring). Insure that the correct handshaking signals are connected on the RS-232 side of the RS-485/-422 converter. Many RS-485 converters use the RTS line to control the transmitter (which must be tri-stated during receive mode). It is important to insure that the converter is configured correctly and the correct handshaking lines are wiring appropriately. If the handshaking lines (RTS) are not wired correctly the connection may appear to work but damage may occur and communications may be unreliable over time. DB-25 from RS-422 converter Signal TXB+ TXARXARXB+ GND (optional) 14 2 5 17 7 Pin CIM Port 2 Pin 1 2 3 4 5 Signal RXB+ RXATXATXB+ GND PM055 Rev 2 00/08/31 12 Thomson Technology SECTION 1 COMMUNICATION INTERFACE MODULE DB-25 from RS-485 converter Signal TXB+, RXB+ (jumpered) TXA-, RXA- (jumpered) GND (optional) · Pin 14,17 2,5 7 Pin 1,4 2,3 5 CIM Port 2 Signal RXB+,TXB+ (jumpered) RXA-, TXA(jumpered) GND Note that the RS-232 side of the RS-485 converter will most likely require the RTS line be connected along with TX, RX and GND. 11.

Troubleshooting Refer to the following list of typical problems. Consult the factory for any detailed information or for any problems not listed. CAUTION!!! Before opening the enclosure to perform any service task, it is imperative to isolate the control system from any possible source of power. Failure to do so may result in serious personal injury or death due to electrical shock. Service procedures must be undertaken by qualified personnel only! SYMPTOM CIM does not power up even with correct DC power applied CORRECTIVE ACTION Check that there are no wiring errors/short circuits connected to the CIM.

Note: The CIM Module contains an electronic fuse that triggers upon an overload or overvoltage condition and does not reset until the supply voltage is removed. Verify all communication cables are connected to the correct ports. Ensure that the RTU's (TSC 800 and MEC 20) are connected to Port 3 on the CIM. Ensure the correct MEC 20 communication port (J7) is utilized. Port J7 is white in color.

The black RJ45 connector on the MEC Failure to communicate with PC (direct connected). PM055 Rev 2 00/08/31 13 Thomson Technology SECTION 1 COMMUNICATION INTERFACE MODULE 20 is for the expansion port, damage may occur to the CIM if this port is connected! When direct connection is used from port 2A to a PC, ensure a null modem cable or connector is used. (see Host PC Connection). Verify all settings in the THS 2000 program are correct. Critical settings are as follows: Port 3 baud rate--4800 Controller address--THS setting and controller setting must match Site Name--THS setting and CIM setting must match. Note: factory default setting in CIM is "site" Site Password--THS setting and CIM setting must match. Note: factory defeat setting in CIM is "user". If multiple MEC 20 controllers are connected to a single system, verify all controller node addresses are different. RTU site may be busy calling out if an alarm condition is present on the controller. Reset all fault conditions at the controller and set for automatic mode to cancel the auto call out condition.

Verify PC modem operates correctly (test independently with another software system). Verify PC modem is set for 9600 baud operation. Ensure phone numbers programmed for both PC site location and RTU equipment location are correct. If you encounter difficulty connecting to a CIM with the Host software make sure the CIM is not trying to call-out. When the CIM is trying to call-out to the Host sites it will not respond to outside requests for connection. In this situation the user can be patient and make repeated attempts at connection until the CIM has exhausted its phone numbers and retries (can be over 12 mins in some cases with 3 numbers and 3 retries). Or the user can let the host successfully call-out to the Host software. After the phone numbers are successfully attempted or retries are exhausted the CIM will go back into a log-in ready state. If time is important, the CIM may be power cycled, for a brief time after the CIM power is restored (after the 2 quick blinks on the Port 2 LED) the CIM will be log-in ready. However the CIM will eventually go into a call-out state to report the site alarm situation.

The above situation is the most common cause for not being Failure to communicate with PC (Modem connected). Failure to communicate with PC. PM055 Rev 2 00/08/31 14 Thomson Technology SECTION 1 COMMUNICATION INTERFACE MODULE able to establish a connection to the CIM. For testing and configuration it is recommended that the call-out function be disabled until it is required, this will eliminate the frustration described above. Verify the connected controller is programmed for the specific auto callout function (i.



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e. common alarm, common shutdown or common fail) Verify the Host software is in auto-answer mode, see THS2000 User Manual, Auto-answer Configuration. The CIM port configuration changes will not go into effect until the CIM has been power cycled. Site RTU fails to auto callout to PC. Port configuration changes do not work.

For Modbus communications ensure that the CIM is being addressed with the correct node address. The factory default CIM node address is '1', this should not be confused with the RTU node addresses connected to Port 3 of the CIM. 1.1.1. Database Re-initialization If state of the internal database is unknown a reset to factory default conditions can be done by the following procedure: a) Remove power from the CIM. b) Remove the CIM back cover. c) Connect a wire from the CIM ground terminal located next to the power connections. d) Connect the other end of the ground wire to the testpoint located on the bottom of the daughter board (the daughter board is plugged into the bottom of the CIM motherboard) located on the bottom of the CIM that should be visible with the bottom cover removed. e) With the bottom testpoint grounded carefully apply power to the CIM for at least 2 seconds. You may now remove power and reassemble the CIM.

The CIM has defaulted back to factory settings. PM055 Rev 2 00/08/31 15 Thomson Technology SECTION 2 THS 2000 SOFTWARE PROGRAM SECTION 2 THS 2000 SOFTWARE PROGRAM 1. Introduction The THS 2000 software program remotely controls and monitors a Thomson Technology (www.thomsontechnology.com) generator/transfer-switch control system. The THS 2000 program operates on an IBM-compatible Personal Computer with Microsoft Windows 95TM, Microsoft Windows 98TM, Microsoft Windows NTTM 4.0 or Microsoft Windows 2000 operating systems (www.microsoft.com).

The THS 2000 program uses a TTI designed protocol to communicate to TTI generator control system site.

A site consists of a single Communication Interface Module (CIM) and one or more associated Remote Terminal Unit (RTU) controllers. The THS 2000 software is designed to allow a direct connection (via RS-232, RS-422 or RS485) to Port 2 of the CIM or a remote connection (via a host PC modem) with the internal modem of the CIM on Port 1. The host PC modem must already be configured before attempting a remote connection. See the operating-system help for installing and configuring modems. Version 3.

1 of the THS2000 is intended for operation with version 3.0 of the CIM, but also provides support for previous versions of the CIM. Throughout this document, text that looks like this for filenames and other computer-type text; text that appears in menus, dialog boxes and buttons looks like this windows-type text. 1.1.

CIM Dialog box MEC 20 Modbus RTU TSC 800 Site Site-list Definitions Communications Interface Module; the communications hub for a site interactive window allowing the user to view or change settings Microprocessor Engine Controller industry-standard serial automation protocol defined by Modicon (www.modicon.com), part of Schneider Automation, Inc. Remote Terminal Unit; in this context, a MEC 20 or a TSC 800 Transfer Switch Controller a CIM and one or more connected RTUs the site-list is the list of remote sites, primarily used for auto-answer and multiple CIM sites PM055 Rev 2 00/08/31 16 Thomson Technology SECTION 2 1.2. Improvements THS 2000 SOFTWARE PROGRAM A number of improvements have been made to this version of the THS 2000 software. Most of the improvements correspond to added features of CIM version 3.0, but some of the changes are applicable to the previous version of the CIM. See Section 1 for more information on device-specific features and Section 3 for the Modbus protocol. The most notable improvement is the use of the Modbus protocol for communications to the CIM.

The new features in THS 2000 are: · Support for new CIM 3.0 Modbus protocol as well as previous CIM protocol versions. Automatic RTU (MEC 20 and TSC 800) discovery on login. This will eliminate the need for the user to program the individual node address and controller type for each site (CIM). See Controller Discovery. · Support for these additional CIM 3.0 features: 32 character telephone numbers for callout, see Auto-answer Configuration; call all numbers option for CIM callout, see Auto-answer Configuration; CIM Port 2 auto-detect feature for the hardware protocol, see CIM Port 2; bounded controller addresses for faster detection, see CIM Advanced. · CIM Port 2 can now be configured for speeds from 1200bps up to 19.2kbps, instead of being fixed at 9600bps. This works for old CIM versions as well.

Support for multiple remote callout sites. THS version 1.0 and 1.1 only support autoanswer for a single site. A system with two CIM sites that can callout, would not work correctly.

This has been fixed by adding multiple sites to a single THS 2000 file. The calling-in CIM is then identified from the loaded set of sites. See Site-list Management. · The MEC 20 digital fault labels that are disabled are blanked out in THS 2000. This feature requires the latest version of the MEC 20.

Improved communications reliability over noisy communication lines. THS2000 version 3.1 adds the ability to connect directly to an RTU, bypassing the CIM. A maximum of one RTU, MEC20 or TSC800, is allowed. The auto-answer feature of THS2000 is not supported in this mode, as it is a function of the CIM. The auto-discovery of controllers is likewise not available. See CIM Bypass Wiring for a wiring description. 1.3. Computer System Requirements The supported operating-systems are: 17 PM055 Rev 2 00/08/31 Thomson Technology SECTION 2 · · · THS 2000 SOFTWARE PROGRAM Microsoft Windows 95TM, Service Release 2 or later; Microsoft Windows 98TM; Microsoft Windows NTTM 4.

0 Workstation or Server, Service Pack 3 or later; Microsoft Windows 2000. A minimum of 2 MBytes of hard drive space on the chosen installation drive is necessary for proper operation. A modem that is fully supported by the operating-system is required for remote operation. It is important that the correct modem driver software is installed correctly. A FIFO-enabled serial-port is required for direct connections. Microsoft Internet ExplorerTM 4.01 or later is recommended for use with the on-line help. However, Microsoft Internet Explorer 3.02 is sufficient if the hhupd.exe file, included with the THS 2000 distribution, is run first; this executable is provided by Microsoft for updating help file support.

1.4. Installation The THS 2000 software consists of two files, the THS3v0.EXE file and the THS3v0.CHM file.

Both files should be copied to a directory on your hard drive, such as C:\THS. The first file, THS3v0.EXE is the THS 2000 executable. You can make a link to this file on your desktop by dragging and dropping the THS3v0.EXE from the explorer to the desktop.

The second file, THS3v0.CHM, is the on-line help file.



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If you are using Microsoft Internet Explorer 3.02, the file hhupd.exe will be required to execute and update a system file for HTML Help support. That file is not required if Microsoft Internet Explorer 4.01 or later is installed. 2. Quick Start This section will get you up and running the THS 2000 quickly and easily. This chapter covers the simple tasks that are necessary to communicate with a site.

More advanced topics will be covered in a later section. 2.1. Step 1 Start THS 2000 (THS3v0.EXE) to start the program. Double-click on the THS 2000 icon See Installation. 2.2. Step 2: Logon The Password dialog box will appear as shown below. Type in your password and click the OK button or just click the OK button if you have not programmed any passwords PM055 Rev 2 00/08/31 18 Thomson Technology SECTION 2 THS 2000 SOFTWARE PROGRAM yet. There are no passwords configured initially, so click on OK to continue if you are running for the first time. See Passwords and Starting And Logging On. 2.3. Step 3: Set Host Connection Method Select the Connect command from the Site menu (or toolbar button or press F9).

This command will normally bring up a list of accessible sites, however, if no sites are defined, you will be required to choose a host connection method. This dialog box is shown below. Select your connection method, either a specific modem (e.g. Hayes Accura 288 V.

34 + FAX) or a serial port (e.g. Direct using COM1). If you select a direct communications port, you are also able to modify the port settings. The default settings are likely sufficient for now, so click the OK button. See Host Connection. PM055 Rev 2 00/08/31 19 Thomson Technology SECTION 2 THS 2000 SOFTWARE PROGRAM 2.4. Step 4: Enter Site Properties Once the connection method is established, you will be prompted for the site properties, such as site name, as shown below. This allows you to enter the first site in the site-list.

The name and password fields correspond to the name and password already programmed into the CIM that is managing the remote site. The description field is optional and can be used to describe the site. The phone number is entered for a remote site. The name and password parameters must match the CIM on the intended site. The default name is "site" and the default password is "user." These parameters are case insensitive. See Site Properties. 2.5. Step 5: Connect To Site The next dialog box displays the list of sites, as shown below.

At this point, there is only one site and it's already selected. From this dialog you can add, remove and modify site properties; modify the connection method; and connect to the selected site. PM055 Rev 2 00/08/31 20 Thomson Technology SECTION 2 THS 2000 SOFTWARE PROGRAM Clicking on the Connect button will begin the connection process. If you experience problems connecting to the remote site, please refer to the troubleshooting section of this manual. See Connecting A Site.

2.6. Step 6: Identify Controllers Once you are connected to the remote site, you need to identify the controllers on the site. If you are running CIM 3.0 or higher, the THS 2000 software will offer the controllers that have already been discovered, as shown below.

You merely need to accept the controller list to have them added to the site. If you are running an older CIM, you must identify and add the controllers manually; see the Adding A Controller section later in this manual. At this point, you are connected and communicating with the CIM and its controllers. The status bar at the bottom of the window will flicker and display a message similar to "Connected to EastWing." 2.7. Step 7: View Controller Data A set of buttons at the top of the window will contain the word List and the number of each controller. This is the Controller Bar. Clicking a button on the Controller Bar selects the current view in the main part of the window. The list-view is a list of all the controllers and the controller views are representations of an individual controller.

When the selected site is connected, the dot in the middle of the controller bar button will indicate the status of the controller (green, yellow, red or black). See Controller Views. 2.8. Step 8: Issue Controller Commands Once connected to a site, commands can be issued to controllers through the Mec20 Command or Tsc800 Command menu items under the Controller menu. See Controller Commands. PM055 Rev 2 00/08/31 21 Thomson Technology SECTION 2 2.9. Step 9: Save/Restore Site-list Information THS 2000 SOFTWARE PROGRAM The current site-list can be saved by using the Save or Save As commands under the File menu or the toolbar button. A previously saved site-list file can be retrieved using the Open command from the File menu or the numbered recent file list under the File menu or the toolbar button.

See Saving A Site-list and Opening An Existing Site-list. 3. Configuration The THS 2000 software allows the configuration of passwords, lists of sites, the Communications Interface Module (CIM) and the auto-answer feature. Configuration of THS 2000 site-lists and other parameters is generally done once and then used many times in an operational capacity. 3.

1. are: 3.1.1. READ-ONLY The read-only user can only monitor an RTU site and may not change any settings or modes of operation.

3.1.2. READ/WRITE The read/write user can monitor an RTU site and may change any settings or modes of operation as desired. 3.1.3. MASTER The master read/write user can monitor an RTU site and may change any settings or modes of operation as desired. The master read/write user can also view or modify the lower-level security passwords. The Options item under the Tools menu will present the user with master security level with a choice that allows the passwords to be modified, as shown below.

For a user with less than the master security level, that menu item is grayed-out. Passwords The THS 2000 program can be secured with the use of passwords. The password levels PM055 Rev 2 00/08/31 22 Thomson Technology SECTION 2 THS 2000 SOFTWARE PROGRAM The site passwords are normally shown as a series of asterisks (*), but can be shown in actual letters by enabling the show-site-password check box. 3.2. Site-list Management THS 2000 allows you to create, save and reopen site-lists. A site-list is a collection of one or more sites that are all accessed through the same host modem. A site-list can also be configured for auto-answer, allowing any of the listed remote sites to call THS 2000 in case of an alarm condition. The list of sites, the site properties, the connection method and the auto-answer settings are all stored in the .THS file.

This file can be created, opened and saved from THS 2000. 3.2.1. Creating A New Site-list A new site-list can be created using the New command from the File menu (or toolbar button).

This command will bring up the Site Properties dialog, as shown, for the first site in the site-list. The name and password fields correspond to the name and password already programmed into the CIM that is managing the remote site.



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All of the site names PM055 Rev 2 00/08/31 23 Thomson Technology SECTION 2 THS 2000 SOFTWARE PROGRAM within a site-list must be unique. The description field is optional. The phone number is entered for a remote site.

3.2.2. Opening An Existing Site-list An existing site-list can be opened using the Open command from the File menu (or the toolbar button).

@@@3.2.3. @@@3.3.1.

@@@The description can be any descriptive text. @3.3.2. @@@@3.3.4. @@@@If a direct communication port is selected, the Port Settings button will click-able. Selecting the Port Settings button will bring up the Port Settings dialog box, as shown below, where advanced communications parameters can be viewed and modified. Supported baudrates are 1200, 2400, 4800, 9600, 14400 and 19200.

The Restore Defaults button set the parameters to RS-232 signal type, no parity, 8 data bits, 1 stop bit and 9600 baud. The RTS activation is only applicable under RS-485. This defines the level of the RTS line that is used by RS-232 to RS-485 converters to signal a transmission. Unless otherwise specified, this should be active high for most converters. These parameters must be matched to the Port 2 configuration of the CIM on the site (see CIM Port 2).

Changes to the port settings do not take effect until the site is reconnected. 3.4. Communications Interface Module Settings The heart of communications to a remote site is the Communications Interface Module (CIM). All the remote controllers, TSC 800s and MEC 20s, are attached to this device.

Normally, the CIM is not connected to the host computer. The PM055 Rev 2 00/08/31 27 Thomson Technology SECTION 2 THS 2000 SOFTWARE PROGRAM normal operation for the CIM is to poll the status of each controller and attempt to discover new controllers. When the status of a controller indicates an alarm condition, the CIM can be programmed to call the host and report that an alarm condition exists. When connected to a host computer running THS 2000, the CIM discontinues its polling and allows the THS 2000 software to interrogate the controllers. The CIM can be configured by selected the CIM Properties item in the Site menu. This will bring up the Current Site Properties dialog box. This window is a tabbed collection of dialogs that query and display different parameters from the CIM, including the site information, version, port configuration and callout phonenumber. When a value is modified, the Apply button will become click-able. Clicking the Apply button will send the changes to the CIM; also, clicking the OK button will send the changes to the CIM if you answer yes to the "save changes" question. Hitting the Cancel button will abort any changes that have not yet been written.

After the new values are written to the CIM, they are read from the CIM and displayed. Some of the CIM's properties screens contain a Refresh button that will simply re-read the data from the CIM. For more information on the CIM, see Section 1. 3.4.1. CIM Site Selecting the CIM Site tab in the Current Site Properties dialog box will produce a display similar to that shown in next figure. The F2 key (or the toolbar button) can also be used to select the Current Site Properties dialog box. From here, you can enter the site name and site password that will be used by the site connection described in section Connecting A Site. PM055 Rev 2 00/08/31 28 Thomson Technology SECTION 2 THS 2000 SOFTWARE PROGRAM The name and password fields have a maximum length of 16 characters and case does not matter.

CIM versions prior to CIM3.0 are limited to 12 characters for the site name and 8 characters for the password. Note: all CIMs that are intended for callout operation to the same site-list must have unique site names. 3.4.

2. CIM Version The CIM Version tab simply reads and displays the version information, including the serial number, from the CIM, as shown below. This may be useful for future compatibility issues and service. PM055 Rev 2 00/08/31 29 Thomson Technology SECTION 2 THS 2000 SOFTWARE PROGRAM Note: CIM version prior to version 3.0 did not have a serial-number or Modbus support; these fields appears as N/A when communicating with one of these older devices.

3.4.3. CIM Callout The CIM Callout tab configured the callout feature, which allows the CIM to call the host in case of an alarm condition. The dialog box is depicted in the next figure. Refer to section Auto-answer Operation for more information on CIM callout and THS 2000 auto-answer features. PM055 Rev 2 00/08/31 30 Thomson Technology SECTION 2 THS 2000 SOFTWARE PROGRAM Note: CIM versions prior to version 3.0 did not support the call-all-numbers feature; this option is grayed-out for those devices. Also, in older CIM versions, all the phone numbers shared the same number of attempts; this is reflected in this dialog box by tying all there attempts choices together, so if one is changed they are all changed. 3.

4.4. CIM Database All the properties of the CIM described in this chapter are stored in an internal database. This database, and thus the CIM properties, can be reset to factory default values by initializing the database. The command to initialize the database can be found in the CIM Database tab of the Current Site Properties dialog box, as shown here. PM055 Rev 2 00/08/31 31 Thomson Technology SECTION 2 THS 2000 SOFTWARE PROGRAM This feature is provided as a last resort. It should not be invoked unless you know what you are doing or you are under the guidance of a qualified service person. 3.4.5.

CIM Port 2 A CIM connected directly to a PC host or a Programmable Logic Controller (PLC) is connected serially to Port 2. The serial connection parameters are under the CIM Port 2 tab of the Current Site Properties dialog box, as shown here. PM055 Rev 2 00/08/31 32 Thomson Technology SECTION 2 THS 2000 SOFTWARE PROGRAM The signal-type indicates the type of physical connection between the host and CIM. The RS-232/Modem option indicates that a connection is via a standard RS-232 cable or the internal modem (CIM Port 1). The RS-422 and RS-485 options are for multi-drop networks. The auto-detect option will allow the CIM to attempt to decide for itself which physical connection is in use. The default signal-type is auto-detect. The other parameters are standard serial type parameters, including parity, data bit size, stop bits and baudrate. The baudrate values can be 1200, 2400, 4800, 9600, 14400 and 19200. The receive-timeout parameter describes the amount of time after receiving the last byte of the packet until the packet is processed internally.

The Restore Defaults button will restore all parameters to their initial values, which are no parity, 8 data bits, 1 stop bit, 9600 baud and 20 millisecond receivetimeout. The Fixed Modbus Mode option is for enabling the fixed Modbus mode for operation with a Programmable Logic Controller (PLC). Once in fixed Modbus mode, the CIM no longer requires a password to login, it is essentially always logged-in to save the PLC from having to do so.



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All modem functions are disabled when in fixed Modbus mode as well, to prevent unauthorized remote access. The only way to disable fixed Modbus mode is to connect directly (via RS-232 or RS-485) with THS 2000, which will disable fixed Modbus mode when attempting to log in to the CIM. Note: the receive-timeout and auto-detect signal-type features were not supported in previous versions of the CIM and therefore their values appear grayed-out and read-only when examined by THS 2000. The protocol used on Port 2 is Modbus, as described in Section 3. 3.4.6.

CIM Port 3 The Port 3 of the CIM is used to communicate with the controllers on the site. The parameters for this port can be found under the CIM Port 3 tab in the Current Site Properties dialog box, as shown here. PM055 Rev 2 00/08/31 33 Thomson Technology SECTION 2 THS 2000 SOFTWARE PROGRAM These values are all currently read-only; you may not change any of these values, they are fixed. 3.4.7. CIM Advanced The CIM Advanced tab of the Current Site Properties dialog box allows you to change some of the more advanced features of the CIM, such as Modbus characteristics and controller polling. The dialog box is shown in the next figure. PM055 Rev 2 00/08/31 34 Thomson Technology SECTION 2 THS 2000 SOFTWARE PROGRAM The top box contains properties unique to the Modbus operation of the CIM (see Section 3.).

The Slave ID is the ID used by the PLC to reference the CIM; the valid range for a Modbus slave device is 1-247. The Poll Bounds parameters are for changing the behavior of the controller discovery polling. Controllers have an address range of 1 to 255, but there is a limit of 10 controllers per site. The Poll Bounds parameters reduce the range of addresses that the CIM must poll in order to discover new devices. Reducing this range to the expected values of the controllers, such as 1 to 10, speeds up response time.

The Response Delay parameter dictates the amount of time, in milliseconds, to wait before sending a response. Note: the advanced features described here are only supported in CIM version 3.0. When THS 2000 is communicating with an older CIM, the CIM Advanced dialog box is not available. 3.

5. Controller Configuration This section deals with the adding and removing of controllers. The controllers currently supported by THS 2000 and the CIM are the MEC 20 Microprocessor Engine Controller and the TSC 800 Transfer Switch Controller. 3.5.1. Controller Discovery The THS 2000 version 3.0 in conjunction with the CIM version 3.0 supports automatic controller discovery. When THS 2000 establishes a connection to a remote CIM, it interrogates the CIM for the list of controllers present on this site.

The user is then prompted to accept this list of controllers or continue with the controllers already loaded. Version of the CIM prior to version 3.0 do not support the controller discovery and controllers must be added manually as explained in the next section (Adding A Controller). 3.5.2. Adding A Controller

Selecting the Add option from the Controller menu allows you to add a MEC 20 or TSC 800 controller to the site from the Add Controller dialog box, as shown below. PM055 Rev 2 00/08/31 35 Thomson Technology SECTION 2 THS 2000 SOFTWARE PROGRAM The controller address can be between 1 and 255, with no duplicates allowed. The controller type can be a MEC 20 or a TSC 800. The description can be any descriptive text you wish.

3.5.3. Removing A Controller Removing a controller is accomplished by selecting the Remove item from the Controller menu which brings up the Remove Controller dialog box, as shown below. The controller to be deleted is selected from the list presented.

3.5.4. Controller Properties A controller's properties can be examined by selected the Properties item of the Controller menu. This brings up a menu from which you can choose the controller to be examined, as shown below.

PM055 Rev 2 00/08/31 36 Thomson Technology SECTION 2 THS 2000 SOFTWARE PROGRAM After the desired controller is selected and the OK button clicked one of two dialog boxes is presented: one for the MEC 20 and one for the TSC 800. The MEC 20 properties dialog box is shown in the following figure. From this window, the description can be modified and other properties, such as the controller address and the fault-labels, can be viewed. The TSC 800 properties dialog box is shown in the next diagram. From here, the controller description can be modified. Additional properties, such as the controller address, can be viewed. PM055 Rev 2 00/08/31 37 Thomson Technology SECTION 2 THS 2000 SOFTWARE PROGRAM 3.6. Auto-answer Configuration An important feature of remote modem sites is the ability to dial the host and report an alarm condition. The host side can be configured from the Auto-answer Settings command of the Site menu, as shown below.

When the auto-answer feature is enabled, the THS 2000 software will accept calls from any site in the currently loaded site-list. 4. Operation 4.1. Basics This section describes the basic functionality of the THS 2000 software, from logging-on to user interface to accessing the online help. See the Quick Start section for a fast get-up-and-running breakdown. PM055 Rev 2 00/08/31 38 Thomson Technology SECTION 2 4.1.1. Starting And Logging On Double-clicking the THS 2000 icon THS 2000 SOFTWARE PROGRAM starts the THS 2000 software.

A splash screen indicating the version and related information is displayed for a short period. You will then be prompted to enter a password, as below. The THS 2000 log on process allows for three different levels of security, depending on the password you entered. The levels are read-only, read/write and master (see Passwords for more information). You also have the option of selecting "Demo mode," which allows you to create some simulated controllers and otherwise operates as if you had "read-only" security privileges.

4.1.2. The Interface The main THS 2000 interface is shown in the next diagram. It is a relatively standard Windows-based application with a title bar, main menu, toolbar and status bar, as well as a controller bar and a special viewing area.

PM055 Rev 2 00/08/31 39 Thomson Technology SECTION 2 4.1.3. Title Bar THS 2000 SOFTWARE PROGRAM The title bar displays the currently loaded site-list file. The site-list file is a collection of one or more generation sites that has been configured and saved previously. The site-list file can be opened, saved and printed from the main menu or toolbar. The THS 2000 site-list files have the file extension .THS. 4.1.

4. Main Menu The main menu provides the access to the THS 2000 commands. Some commands are available only under certain circumstances; when the command is not available, it is grayed-out. For example, you will not be able to add a controller (Add from the Controller menu) until you have created an initial site (Connect from the Site menu or New from the File menu).



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The main menu commands are also available using ALT-key combinations; the underlined character indicates the key to press in combination with the ALT key. Many of the important commands are available using function keys; these are indicated in the pull-down menus. 4.1.5. **Toolbar** The toolbar provides instant access to many important menu commands.

When the mouse pointer is floated over the tool item, a tool tip is displayed in the status line portion of the status bar. 4.1.6. **Controller Bar** The controller bar contains a button called List and a button for each controller on the site.

The controller buttons are labeled using the controller's identification number (id). Pressing a button on the controller bar will change the view to display the selected controller or the controller-list view. When the selected site is connected, the dot in the middle of the controller bar button will indicate the status of the controller (green, yellow, red or black). 4.1.

7. **Status Bar** The status bar displays status messages and indicates connection status and security status. The status line displays tool tips and various status messages. The connection status indicates the state of the current connection, such as PM055 Rev 2 00/08/31 40 Thomson Technology SECTION 2 THS 2000 SOFTWARE PROGRAM "Idle" or "Connected to EastWing." The security status indicates with which security level you have logged on. 4.1.8. **View** The view area displays one of two different views. The list-view shows a tabular list of the controllers on the selected site.

The controller-view displays data from either a MEC 20 or a TSC 800. 4.1.9. **Accessing Help** The command Contents from the Help menu, the toolbar button or the F1 key will bring up an online reference. 4.1.10. **Exiting** The Exit command from the File menu will exit THS 2000, disconnecting any outstanding connections. 4.

2. **Connecting Sites** A site is made up of a single CIM connected to one or more controllers. Connecting to a site is the same as connecting to a CIM. From the user's point of view, the CIM is the site. This section describes how sites are connected and disconnected as well as various properties of the CIM and the host connection.

Only a single site from the site-list can be connected at a time. 4.2.1. **Connecting A Site** A site can be connected using the Connect command from the Site menu, the toolbar button or the F9 key.

This will bring up the Connect To dialog depicted in the next figure. PM055 Rev 2 00/08/31 41 Thomson Technology SECTION 2 THS 2000 SOFTWARE PROGRAM This dialog lists each site contained in the currently loaded site-list and allows you to select the site to which a connection is desired. Clicking the Connect button will initiate a connection attempt. In addition, double-clicking on the site name will initiate a connection attempt. In addition, sites can be added to or removed from the site-list or simply have their properties modified. A button labeled Connect Using is provided to jump to the host connection settings (see Host Connection). 4.2.2. **Disconnecting A Site** Selecting the Disconnect command from the Site menu, the toolbar button or the F10 key will disconnect the currently connected site.

This includes hanging up the phone line for a modem connection. 4.3. **Viewing And Commanding Controllers** The main function of the Communication Interface Module (CIM) is to facilitate communication to the controllers present on the site. The controllers currently supported by the CIM are the MEC 20 Microprocessor Engine Controller and the TSC 800 Transfer Switch Controller. The main view of the THS 2000 provides a simulated front-panel of a single controller. Controllers can be added, removed and examined from menu commands. 4.3.1.

Controller Views The bulk of the THS 2000 window is the view area. This area can be a simple list of the controllers or a more detailed representation of a single controller. The controller bar buttons are used to select the desired controller or the controller-list (see also The Interface). The controller bar contains a button called List and a button for each controller on the site. The controller buttons are labeled using the controller's identification number (id). Pressing a button on the controller bar will change the view to display the selected controller or the controller-list view. When the selected site is connected, the dot in the middle of the controller bar button will indicate the status of the controller (green, yellow, red or black). The next figure shows the view of a MEC 20 connected to a remote CIM. The MEC 20 indicates that it is currently in shutdown mode. The black part of the view is generally the same as the front panel of the actual MEC 20 device.

The PM055 Rev 2 00/08/31 42 Thomson Technology SECTION 2 THS 2000 SOFTWARE PROGRAM display and buttons work as it were the actual device. Additional information includes the digital fault status and labels, analog fault status and present measured values. The figure below shows the view of a TSC 800 connected to a remote CIM. Just as the MEC 20, the black part of the view is a direct emulation of the TSC 800 front panel. The faults and values are displayed and updated frequently. 4.3.2. **Controller Commands** The controllers can also be commanded to perform control functions remotely. The control functions can be found under the MEC 20 Command or TSC 800 Command items of the Controller menu.

The controller in the current view is the PM055 Rev 2 00/08/31 43 Thomson Technology SECTION 2 THS 2000 SOFTWARE PROGRAM controller being commanded. The control functions available vary by type of controller. The commands available for the MEC 20 are shown in next figure. The commands for the TSC 800 are shown in the next figure. 4.4. **Printing** Using the print command (the Print item from the File menu or the toolbar button) while viewing a controller will print the currently displayed values in a simple text format. The print command will print the list of controllers when invoked while viewing the controller list. 4.5.

Auto-answer Operation When a remote CIM senses that a controller desires a Callout, it will start the calling out sequence. The CIM will dial its stored phone numbers some amount of times until it makes a connection (see CIM Callout). The site in which the CIM belongs must currently exist in the site-list of the THS 2000 program. PM055 Rev 2 00/08/31 44 Thomson Technology SECTION 2 THS 2000 SOFTWARE PROGRAM When an auto-answer connection is established, an event is registered in the Auto Answer dialog box, as shown below, and logged in the auto-answer log file (see Autoanswer Configuration).

When a site has connected, it will remain connected for two minutes just as if connected by the operator.

During this time, the operator can view the controllers and determine the cause of the alarm. The status bar will also display a countdown of the remaining connection time in seconds. 5. **CIM Bypass Wiring** The CIM bypass connection mode of operation has a different wiring scheme than a standard CIM connection.



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The two possible methods of connection are: direct--from computer to controller and modem--from computer to local modem to remote modem to controller. The direct connection bypass mode is shown below: RS-232 IBM Compatible RS-232 to RS-422 RS-422 The modem connection bypass mode is shown below: Computer Modem RS-232 NULL RS-422 RS-232 to RS-422 PM055 Rev 2 00/08/31 45 Thomson Technology SECTION 2 THS 2000 SOFTWARE PROGRAM An RS-232 to RS-422 converter is required to convert the signal from the computer or modem. The required wiring from the RS-422 side of the convert to the RJ-45 connection on the controller is as shown: RS-232 RS-422 TDB(+) TDA(-) RDA(-) RDB(+) GND RJ-45 1 2 3 4 5 6 7 8 To modem or computer To Controller Converter unused The RS-232 NULL connection between the modem and the converter must pass all handshake signals, as shown in the following diagram: Signal/Pin DB-9 Pin/Signal Signal/Pin DB-25 Pin/Signal TD RD RTS CTS DSR CD DTR GND 3 2 7 8 6 1 4 5 3 2 7 8 6 1 4 5 TD RD RTS CTS DSR CD DTR GND TD RD RTS CTS DSR CD DTR GND 2 3 4 5 6 8 20 7 2 3 4 5 6 8 20 7 TD RD RTS CTS DSR CD DTR GND The modem must store configuration in a non-volatile storage medium (such as FLASH). The modem must be configured for the following features: auto-answer, connect at 4800 bps only (no fallback), echo disabled, no error correction, no compression. PM055 Rev 2 00/08/31 46 Thomson Technology SECTION 2 THS 2000 SOFTWARE PROGRAM All RS-232 to RS-422 converters and modems are not created equal. Thomson Technology has tested many converter and modem combinations and the recommended parts are: 3Com USRobotics V.90 56K Faxmodem and B&B Electronics RS-232/RS-485 Converter Model 485PTBR (also an RS-422 converter). The modem must be configured prior to operation with the DIP switches set to (DOWN is ON): Switch Position: 1 DOWN 2 UP 3 DOWN 4 DOWN 5 UP 6 UP 7 UP 8 DOWN and the following initialization strings: AT Q0 E0 V1 X4 &K0 &D0 &M0 &B0 &H0 &R1 &N4 AT S0=1 AT &W0 6. Troubleshooting SYMPTOM Cannot communicate with the site. THS 2000 software locks up. CORRECTIVE ACTION See the CIM User Manual Troubleshooting for possible solutions.

The Host software may lock-up if auto-answer mode is on when running in direct mode, the Host software is trying to write to a modem when it may not be present. The solution is to disable auto-answer (see Auto-answer Configuration). Check that Microsoft Internet Explorer 4.01 or later is installed. Ensure that the THS3v0.CHM file is located in the same directory as the THS3v0.EXE file. You need to run the hhupd.exe file included with the THS 2000 distribution diskettes. Unable to view on-line help: "The THS 2000 help file (THS3v0.chm) could not be located." Unable to view on-line help: unable to load a file called hhctrl.ocx. PM055 Rev 2 00/08/31 47 Thomson Technology SECTION 3 CIM PROTOCOL SECTION 3 CIM PROTOCOL 1. Introduction This protocol document is applicable to version 3.

0 of the Communication Interface Module (TTI). The Communication Interface Module (CIM) provides the hardware and software interface between a ModbusTM compliant master device (customer supplied) and the specific Remote Terminal Units (RTUs) as used at a generator site. The Remote Terminal Unit (RTU) in this context is a device which directly operates the equipment at a generator site. These devices are the actual microprocessor-based controllers as developed by Thomson Technology, Inc. and include the MEC 20 Engine Controller and the TSC 800 Transfer Switch Controller. NOTE: This instruction manual provides detailed information on the CIM 3.0 ModbusTM protocol. For detailed information on a the CIM 3.0 hardware and installation, see the Section 1. For information on operation CIM 3.0 using the THS2000 3.0 software program, see the Section 2. For more information on specific RTU devices, refer to their associated instruction manuals. For more information on the ModbusTM protocol, visit the Modicon web site at www.modicon.com.

com. The communications protocol is split in to the physical layer, the datalink layer and the application layer. 2. Physical Layer At the Physical Layer, the CIM device is connected to a Modbus Master through CIM Port 2 (DB-9 or RJ-45) which is configurable to RS-232/-485/-422 and up to 19200 baud. The MEC 20s or TSC 800s connect to the CIM (Host) through an RS-422 interface via an RJ-45 connector to CIM port 3b. Up to 10 remotes can be connected to a single CIM (Host), as shown below: PM055 Rev 2 00/08/31 48 Thomson Technology SECTION 3 CIM PROTOCOL The remote's receive lines are always enabled. The remote's transmit lines are only enabled while transmitting. There is no hardware flow control. 3. Datalink Layer NOTE: Unless noted otherwise, all fields described in this document contain unsigned binary data stored in big-endian (most significant byte first) format.

Any unused fields contain zeroes. When describing the fields, FALSE equals zero, and TRUE equals nonzero. At the Datalink Layer, the host (master) is responsible for polling the CIM's. The host sends request packets to the remotes, and the remotes respond with response packets. The CIM acts like a local host (master) to the MEC 20's connected.

The CIM takes care of gathering data from the individual MEC 20's and storing it in a local database. The communication format describes an interface with the CIM database. PM055 Rev 2 00/08/31 49 Thomson Technology SECTION 3 CIM PROTOCOL Unfortunately due to processing limitations response packets from the CIM to the host can have up to 25ms gaps in the data. The CIM response data is shifted out in 16 character increments, in some cases it can take up to 25 ms to shift out the next 16 character buffer. The host pre-transmit delay is the minimum time required between the reception of the last byte of a frame (response) and the transmission of the first byte of a new frame (request).

The following values show the necessary pre-transmit delays to insure reliable transmission of data to the CIM. baudrate 1200 2400 4800 9600 14400 19200 delay(ms) 130 80 40 30 30 30 The typical CIM, MEC 20 and TSC 800 data is accessible through direct register read and writes. Programming the CIM is done using the same protocol with the CIM ID instead of the MEC ID. 4. Preset Multiple Registers (Type 16) The preset multiple registers packet is used to write specific values to the controllers. Numeric values are shown in hexadecimal. Preset Multiple Registers Request The packet format for this request is shown below. ss 10 aaaa ss MEC 20 ID (00 to FF) aaaa Starting register (4aaaa) pppp Register count (number of points) bb pppp bb rrrr . . .

rrrr cccc PM055 Rev 2 00/08/31 50 Thomson Technology SECTION 3 Number of bytes (register count x 2) rrrr Register data (16 bit data) cccc CRC-16 (see CRC Calculation) 4.



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