

TESTEQUITY

Model TE-1055 Ethernet Interface Instructions

Scope

This document describes how the TestEquity 1055 Ethernet Converter integrates with TestEquity Chambers.

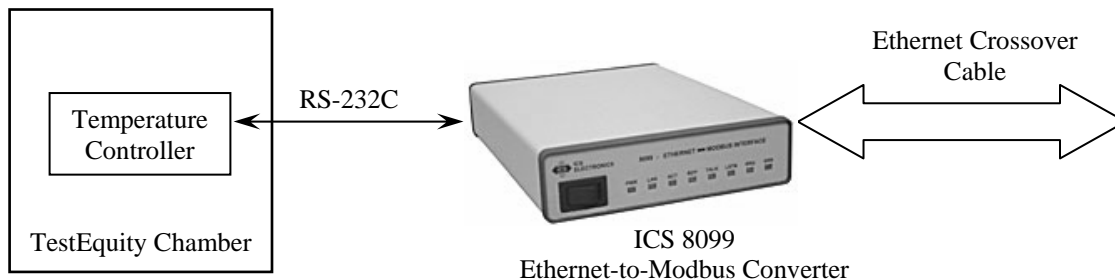
Please read the ICS Model 8099 Ethernet-Modbus Instruction Manual FIRST to configure the device to your computer or network (especially Section 2), and for detailed device instructions.

COMPATIBILITY NOTES:

1. Firefox Web Browser Version 2.0 is not compatible with the Internal Web Server. Firefox 2.0 does not always generate the correct CGI instructions when you press Activate or Update on the web page. Event Output conditions will not update reliably due to this bug. Firefox 3.5.6 as well as current versions of Internet Explorer and Opera are compatible.
2. This Ethernet Interface Converter is NOT compatible with Watlow WatView software.

Introduction

The Ethernet communications is achieved through an ICS Electronics 8099 Ethernet-to-Modbus Interface Converter. It lets the user send simple commands with ASCII values over a 10/100 Mb/s TCP/IP network to control and query the Watlow F4 Controller used on TestEquity chambers. The 8099 converts these simple commands into the Modbus RTU packet protocol and adds the CRC checksum to make a complete Modbus RTU packet.



Serial Communications Parameters

The ICS 8099 is set at the factory for 9600 baud and a Modbus address of 1. All TestEquity chambers currently ship with the F4 communication parameters set for 9600 baud and an address of 1. You do not need to check or change anything.

TestEquity chambers shipped around October 2004 or earlier may have the F4 baud rate set for 19200 and it must be changed to 9600. This is located in Main Page\Go to Setup\Communications. If you are unable to change the setting from 19200, then this menu has been locked. Call TestEquity at 877-512-3457 or 805-480-0638 for instructions on how to access this menu if it is locked or has a password.

Internal Web Server

The ICS 8099 as purchased from TestEquity has internal web pages designed for use with TestEquity Chambers. Functions include Setpoint entry and readback, readback of actual chamber temperature and humidity, °C or °F setting, and Event Output setting/readback.

The home page (index.html) has links to three different TestEquity-specific web pages. The index page is served when the converters IP address is entered in any web browser.

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Temperature Chamber Page (temperature.html) – For TestEquity temperature-only chambers. (Models 105A, 115, 140, 1007C, 1007S, all 1020 and 1027)

Temperature Chamber with Part Monitor Page (part_temperature.html) – For all TestEquity temperature-only chambers with Option 006, configured for either monitor or cascade (part-temperature) control (Models 105A, 115, 140, 1007C, 1007S, 1027C, all 1020 and 1027 with option 006). Adds the ability to monitor the part temperature reading from the F4 Controller's Input 3.

Temperature-Humidity Chamber Page (humidity.html) – For all TestEquity Temperature-Humidity Chambers (Models 123H, 1007H, 1207C). Adds the ability to control and monitor the humidity.

Model TEC1 Temperature Chamber Page (tec1.html) – For TestEquity TEC1 Thermoelectric Temperature Chamber only.

CAUTION: Changing °C-°F in Temperature-Humidity chambers (Models 1007H and 1207C) will erase all stored profiles in the F4 Controller! For Temperature-only chambers, the profiles will convert °C-°F and remain stored.

F4 Modbus Communication

The F4 Controller relies on a communication protocol called Modbus. Data for the device is organized into registers. Register data is set by sending a Write command to a specific register, and is examined by sending a Read command to a register. The commands to read and write data in registers are performed by commands sent to the ICS 8099. These commands do resemble the final command that the F4 Controller sees, but the ICS 8099 also generates and sends a block checksum based on all the characters of each message and sends it to the F4 Controller.

Modbus Register Read / Write Commands:

The R? command is the basic read command. The '?' is optional and is included so programs like ICS's VXI-11 Keyboard control programs can automatically read back and display the response from a query. Below is the read and write syntax.

R? reg, n Read register command
 Reg = Modbus register
 n = number of registers to send

The W command writes 16-bit integers to a register.

W reg, data Write register command
 Reg = Modbus register
 Data = ASCII data written as 16-bit decimal value

Common Modbus register numbers for a variety of controller functions appear on the following page.

Common F4 Modbus Registers

Temperature Registers

Register	Function	Description	Read/Write
100	Input 1 Value, Status	Chamber Temperature	r
300	Set Point 1, Value	Temperature Set Point	r/w
606	Decimal Point, Analog Input 1	To determine decimal placement	r
901	°F or °C, System	°F or °C	r/w

Humidity Registers (for humidity chambers only)

Register	Function	English Display	Read/Write
104	Input 2 Value, Status	Chamber Humidity (% RH)	r
319	Set Point 2, Value	Humidity Set Point (% RH)	r/w
616	Decimal Point, Analog Input 2	To determine decimal placement	r

Part Temperature Monitor Registers (for temperature chambers with option 006 only)

Register	Function	Description	Read/Write
108	Input 3 Value, Status	Part Temperature	r
626	Decimal Point, Analog Input 3	To determine decimal placement	r

Digital Output Registers

Register	Function	Description	Read/Write
2000	Digital Output 1, Condition	Event 1 (Off/On)	r/w 0 or 1
2010	Digital Output 2, Condition	Event 2 (Off/On)	r/w 0 or 1
2020	Digital Output 3, Condition	Event 3 (Off/On)	r/w 0 or 1
2030	Digital Output 4, Condition	Event 4 (Off/On)	r/w 0 or 1
2040	Digital Output 5, Condition	Event 5 (Off/On)	r/w 0 or 1
2050	Digital Output 6, Condition	Event 6 (Off/On)	r/w 0 or 1
2060	Digital Output 7, Condition	Event 7 (Off/On)	r/w 0 or 1
2070	Digital Output 8, Condition	Compressor (Read Only)	r 0 or 1

The entire listing of Modbus registers for the Series F4 Controller is found in the Watlow Series F4 User's Manual, Chapter 7. This manual is located on the TestEquity Environmental Chamber Support CD.

Reading Chamber Temperature Example for F4 Controller

The Temperature Controller sends data over the Modbus interface with an implied decimal point. It is left to the user to remember this, and to scale the data accordingly. The Temperature Controller has been configured by TestEquity to display one decimal point in the temperature reading. If the configuration should change, then the program would not report the correct temperature reading. To remedy this problem, always read the number of decimal points used by before running the program.

Command: **R? 606,1<lf>** ! Send read command to F4 register 606
Response: *iData <lf>* ! Returned variable *iData* represents ASCII
! numeric characters that are converted in this
! example to integer.
! 0 = no decimal point
! 1 = one decimal point

Command: **R? 100,1<lf>** ! Send read command to F4 register 100
Response: *fTemp <lf>* ! Read the value of register 100. *fTemp*
! represents ASCII numeric characters,
! converted to float type.

```
if iData = 1 then          ! Check iData
    fTemp = fTemp / 10 ! 1=means that data has decimal and
endif                    ! we need to divide by ten.
print "Chamber Temp is", fTemp
```

Set Chamber Setpoint Examples for F4 Controller

Command: **W 300, 230 <lf>** ! Send write command to register 300 and
! change the temperature setpoint to 23.0 degrees.

Command: **W 300, 1005 <lf>** ! Send write command to register 300 and
! change the temperature setpoint to 100.5 degrees.

Command: **W 300, -255 <lf>** ! Send write command to register 300 and
! change the temperature setpoint to -25.5 degrees.

EZ-Zone Controller Modbus Communication (for TEC1)

Floating Point Variables

EZ-Zone PM Series controllers use two consecutive register to control a value or to read back a process variable. The two registers hold an IEEE-754 32-bit floating point word. The registers are read and written to in the low word-upper word order.

Floating Point Write

The WF command writes the num value in floating point format to two consecutive registers starting with the low word register.

To enter a temperature setpoint:

WF 2160, 50 'writes 50.0°C to registers 2160 and 2161

WF 2160, 15.5 'writes 15.5°C to registers 2160 and 2161

Floating Point Read

The RF? query reads a 32-bit floating point value from two sequential register in low word-upper word order. The RF? does not require the number of register to read since it is fixed at two registers.

To read the actual chamber temperature:

RF? 360 'reads registers 360 and 361

The [?] is an optional symbol for smart programs like ICS's GPIBKybd program. These programs can recognize the command as a query and automatically read the response.

Additional Resources

Additional resources can be downloaded from http://icselect.com/ab_note.html under "VXI-11 Ethernet Application Notes".

IMPORTANT NOTE: The examples shown in documentation from ICS are for illustration purposes only. They may not represent the correct setup or configuration for TestEquity chambers. Sample programs from ICS may change critical setup parameters, resulting in improper chamber operation. They are provided as a guideline for how to write your own programs only. Correct setup parameters are documented in the TestEquity chamber manuals.

ICS Manual Errata

To reflect the standard decimal point configuration of 0.0° in TestEquity chambers, the ICS Electronics manual, Page 3-27, should be corrected as follows:

3.8.5 Writing to the Modbus Device

The W command writes 16-bit integers to a register. The command parameters depend upon the specific Modbus device. In the following example, a value of 50.0 is written to register 300. i.e.

W 300, 500 'sets F4 temperature setpoint to 50.0