

HEALY-RUFF



Hydro-Pneumatic Tank Controller

HTC200 and 300 Series

User Manual

Preface

This manual explains how to use the Healy-Ruff Hydro-pneumatic Tank Controllers.

Copyright (C) 2012 ICS Healy-Ruff. All rights reserved. No part of this publication may be reproduced, transmitted, transcribed, stored in a retrieval system, or translated into any language or computer language, in any form by any means, electronic, mechanical, magnetic, optical, chemical, manual or otherwise, without prior agreement and written permission of ICS Healy-Ruff.

Information in this document is subject to change without notice.

Trademarks

Ethernet is a trademark of Xerox Corporation

Micro SD is a registered trademark of SanDisk Corporation

icontrol is a registered trademark of Instrument Control Systems, Inc.

For user manual updates, contact ICS Healy-Ruff:

North America:

Tel: (763) 559-0568

Fax: (763) 559-2187

Web: www.icshealyruff.com

Email: sales@icshealyruff.com

LIMITED WARRANTY AND LIMITATION OF LIABILITY

ICS Healy-Ruff warrants to the original purchaser that the Micro-VPAC IIT LSC is free from defects in material and workmanship under normal use and service. The obligation of ICS Healy-Ruff under this warranty shall be limited to the repair or exchange of any part or parts which may prove defective under normal use and service within two (2) years from the date of purchase or eighteen (18) months from the date of installation whichever occurs first, such defect to be disclosed to the satisfaction of ICS Healy-Ruff after examination by ICS Healy-Ruff of the allegedly defective part or parts.

Contents

1.	Description of Operation	7
2.	How to use the Menus and set Variables in the Micro V-PAC II.....	7
2.1.	Changing Variables	7
3.	Main Screens and Pump Status	8
3.1.	Pressure Screens	8
4.	Main Menu Screen	8
4.1.	Setpoint Screens.....	8
4.2.	Alarms	10
4.3.	Setup Screens.....	10
4.4.	Security	11
5.	Example of how to change the SYSTEM PRESSURE variable.....	11
6.	Useful Data and Formulas	13
7.	Installation Diagram	14
8.	Panel and Chassis Layout	15

1. Description of Operation


The HTC is a two (2) or three (3) pump hydro-pneumatic tank control with an integral or remote mount float column. A hydro-pneumatic tank is a vessel in which water is maintained within a desired pressure range above atmospheric. The tank is partially filled with water and the remainder of the volume is compressed air.

With the water level and the air pressure in the tank at their desired maximum values and the pump(s) and air compressor(s) disabled: as water is withdrawn to supply the demand, the air expands which causes its pressure to be reduced. After withdrawal of a predetermined quantity of water, the pump(s) are started (based on tank pressure) and caused to deliver to the tank the same amount of water which had been removed.

The air in the tank will be compressed as the water volume is increased; when the pump(s) are stopped either by electrode or float switch in the float column, the air pressure will be close to or at its desired maximum value.

When the pumps stop, system pressure is monitored and air is either added or removed to optimize the system pressure. For instance, systems that utilize vertical turbine well pumps will typically add a column of air to the system every time they start necessitating removal of air when the tank is finished filling. Systems that utilize closed loop booster pumps to fill the tank may need to have air added when the tank is finished filling to replace air which is absorbed by the water.

2. How to use the Menus and set Variables in the Micro V-PAC II

When you first power up the HTC, alarms may start to display on the screen. To clear the alarms press the right selection arrow  key two (2) times then F2 to clear each alarms or F4 to clear all alarms.

2.1. Navigating Menus

A menu lists various options for the user. A menu is easily selected by using the small, white arrow keys ◀ ▲ ▼ ▶ located under the display screen to move to the item the user wants to select. When the correct menu item is highlighted, press **ENTER** to select it.

2.2. Changing Variables

A variable is a setpoint that you, the operator, can control. Values such as high pressure limit, whether to alternate pumps, or the time which the system will wait to turn off the lag pump when signaled to stop can all be controlled by the operator and are considered “variable”. Use the up – down navigation arrow keys (▲ ▼) to move the cursor to the menu item you want to select; when it is highlighted, press **ENTER** to select it.

After choosing a variable from a menu, for example the System Pressure Set Point or Lead Pump Start, you are shown a screen describing the variable, and that variables current value. Press **ENTER** and the value in the box will become highlighted, use ▲ ▼ or numeric keypad to change the value. Press **ENTER** when you have completed changing the value and the value in the box will no longer be highlighted. Where screens display more than one variable, use ▲ ▼ to select the desired variable and press **ENTER** to select.

Using the **F1** and **F5** key, you can move forward and backward through the sub menu selections screens; press the **F3** key at any time to be returned to the main menu.

3. Main Screens and Pump Status

The default screen is the SYSTEM PRESSURE screen. From this screen that operator can navigate to the The Following is a list of sub menu options and the variables they control

3.1. Pressure Screens

- 1 System Pressure (this is the Main Screen)
 - a Displays tank pressure in pounds per square inch (P.S.I.).
- 2 Suction Pressure (Option)
 - a Displays Suction pressure in pounds per square inch (P.S.I.).
- 3 Pump 1 Status
 - a Reports if pump #1 is off, called, running or failed
 - b Reports daily pump #1 run time
 - c Reports daily pump #1 starts
 - d Reset failed pump from this screen
- 4 Pump 2 Status
 - a Reports if pump #2 is off, called, running or failed
 - b Reports daily pump #2 run time
 - c Reports daily pump #2 starts
 - d Reset failed pump from this screen

4. Main Menu Screen

The Main Menu Screen (**F3**), Consists of the following sub menus:

- Exit (takes you back to the Main Screen)
- Set Point Screens
- Alarm Screens
- Setup Screens
- Security Logon Screens

4.1. Setpoint Screens

Note: you must be logged on before any changes may be made, see Security in next section.

- 1 System Pressure Set Point
 - a Stores the user specified pressure setting. To change, press **ENTER** once. The box around the value will become highlighted, use the numeric keypad to enter the desired system pressure (in P.S.I.). Press **ENTER** again, the highlighted area will disappear; press **F3** to return to the main menu. Press **F5** to move to the next sub menu screen.
- 2 Tank Low Press Alarm
 - a The system pressure level at which you want to be notified that you have low tank pressure. The delay setting allows you to set a time (in seconds); that the system pressure must be below the Low Pressure Alarm set point, in order to cause an alarm.
- 3 High Pressure C/O Alarm [High pressure cut out alarm]

- a Pressure at which the High Pressure Alarm shuts down run signals to all pumps. The delay setting allows you to set a time (in seconds); that the system pressure must exceed the High Pressure C/O Alarm set point, in order to cause an alarm.
- 4 High Pressure C/O Rstr [High pressure cut out restore]
- a Pressure at which the High Pressure Alarm resets. The delay setting allows you to set a time (in seconds); that the System pressure must be lower than the High Pressure C/O Rstr set point for this amount of time, in order to reset the High Pressure C/O Alarm.

Note: The High Pressure C/O Alarm and High Pressure C/O Rstr (restore) settings help to prevent pump short cycling after a High Pressure C/O Alarm.

- 5 Lead Pump Start
- a The tank level set point (in feet or PSI) that you want the lead pump to start at. The delay setting allows you to set a time (in seconds); the pump will delay starting when the tank level has reached the lead pump start set point.
- 6 Lag Pump Start
- a The tank level set point (in feet or PSI) that you want the lag pump to start at. The delay setting allows you to set a time (in seconds); the pump will delay starting when the tank level has reached the lead pump start set point.
- 7 Pump Stop Delay
- a The delay setting allows you to set a time (in seconds); that the pump will run after float column calls for the pumps to stop. There is a separate setting for the lead and lag pumps.
- 8 Low Suction C/O Alarm [Low Suction Cut Out Alarm]
- a The lowest pressure (in P.S.I.) allowed on the pump water supply before the V-PAC II turns the pumps off.
- 9 Low Suction C/O Rstr [Low Suction Cut Out Restore]
- a The lowest pressure (in P.S.I.) allowed on the pump water supply side before the V-PAC II allows the pumps to turn on again.

Note: The Low Pressure C/O Alarm and Low Pressure C/O Rstr (restore) setting help to prevent pump short cycling after a Low Pressure C/O Alarm.

- 10 Pump Sequence Select "1-2", "2-1", or "Auto". For three pump, select "1-2-3", "2-3-1", "3-1-2" or "Auto"
- a 1-2 will always call pump #1 as lead and pump #2 as lag, 2-1 will always call pump #2 as lead and pump #1 as lag and Auto will alternate which pump is lead after the lead pump stops.

NOTE: "Enable Alternation" must be set to "YES" in the Set Up menu for this to function.

- 11 Pump Fail Delay
- a Time the system will wait for a run signal after the pump is called to run, before generating a pump fail alarm. There is a separate setting for Pump #1 and Pump #2.

4.2. Alarms

When the alarm screen comes up with an alarm, read the alarm message and then press the upper left hand arrow next to the display twice. A pop up menu will appear, press **F3** to acknowledge the alarm and clear it, or choose one of the other selections.

If you chose the alarm screens from the main menu, you can view active alarms on the alarm screen you are taken to or press **F5** to go to the alarm history page. The alarm history page will give you a time date stamp of past alarms and alarm acknowledgements. (Approximately 24 entries)

- 1 High P.S.I. C/O Clear/Alarm
 - a The text on the first line gives you the date, the time the alarm occurred, if it was an alarm (ALM). Or the date and the time the alarm was acknowledged (ACK); the second line tells what the alarm was.
- 2 Low P.S.I. Clear/Alarm
 - a The text on the first line gives you the date, the time the alarm occurred, if it was an alarm (ALM). Or the date and the time the alarm was acknowledged (ACK); the second tells what the alarm was.
- 3 Low Suc. C/O Clear/Alarm
 - a Alarm (ALM). Or the date and the time the alarm was acknowledged (ACK); the second tells what the alarm was.
- 4 Pump 1 Fail Clear/Alarm
 - a The text on the first line gives you the date, the time the alarm occurred, if it was an alarm (ALM). Or the date and the time the alarm was acknowledged (ACK); the second tells what the alarm was.
- 5 Pump 2 Fail Clear/Alarm
 - a The text on the first line gives you the date, the time the alarm occurred, if it was an alarm (ALM). Or the date and the time the alarm was acknowledged (ACK); the second tells what the alarm was.

4.3. Setup Screens

Note: you must be logged on before any changes may be made, see Security in next section.

- 1 Pressure Transducer Size (In P.S.I.)
 - a Enter the tank pressure level transducer pressure rating by using the keypad. The Micro V-PAC II will calibrate itself. This is a 4 – 20mA signal.
- 2 Suction Trans. (In P.S.I.)
 - a Enter the suction pressure transducer pressure rating by using the keypad. The Micro V-PAC II will calibrate itself. This is a 4 – 20mA signal.
- 3 Monitor Suction Pressure
 - a Determines if the suction cut-out / restore function will be used.
 - b Select either Yes or No
- 4 Alternation Enable
 - a Determines if the pumps will alternate.
 - b Select either Yes or No

5 Number of Pumps

- a Select SIMPLEX, DUPLEX or TRIPLEX to set the maximum number of pumps to run at a time. If the the system is setup for a three pump system and DUPLEX is selected for NUMBER OF PUMPS, when in Auto, a maximum of two pumps are allowed to run at any time even though there are three pumps int the system. The alternator will alternate through all three pumps but only two pumps are allowed to run at a time. If simplex is selected, then only one pump will run but at the beginning of the next cycle the next pump in the sequence will be called.

6 Pump Fail Enable

- a Selects if you want to monitor the run status of your pumps. Functions using the Pump Fail Delay Set Point.
- b Select either Yes or No

7 Air Option

- a Select Air Add or Air Vent function. In the rare cases when both air add and air vent are both required to operate; contact ICS Healy Ruff.

4.4. Security

- 1 Setup Screens are in a password protected area in the program that allows the user to set up the parameters for his individual system. Options such as alternation, air add or vent, tank transducer size, and more are included here.
- 2 To access the Setup and Setpoint screens you must logon. Press **F3** for the MENU and scroll down to Security Logon and press **ENTER**. The factory default is 00000. Up to five numbers may be entered for a security password. If you change the security logon password make sure you save this number for future access. To keep the default factory password just press Logon and you will be able to make changes. When complete should then logoff in the same manner.
- 3 To change the password, go to the security screen using the method in step 2 above and logon. Press the **F5** key to bring up the password window. Press the **ENTER** key and the password box entry will be highlighted, enter your password using the keypad and then press **ENTER** again.

If you have entered the correct security password, you will be taken back to the security log on screen. Press F3 to be taken back to the main menu, you will then select "Setup Screens" again and this time you can access the Setup and Setpoint Screens.

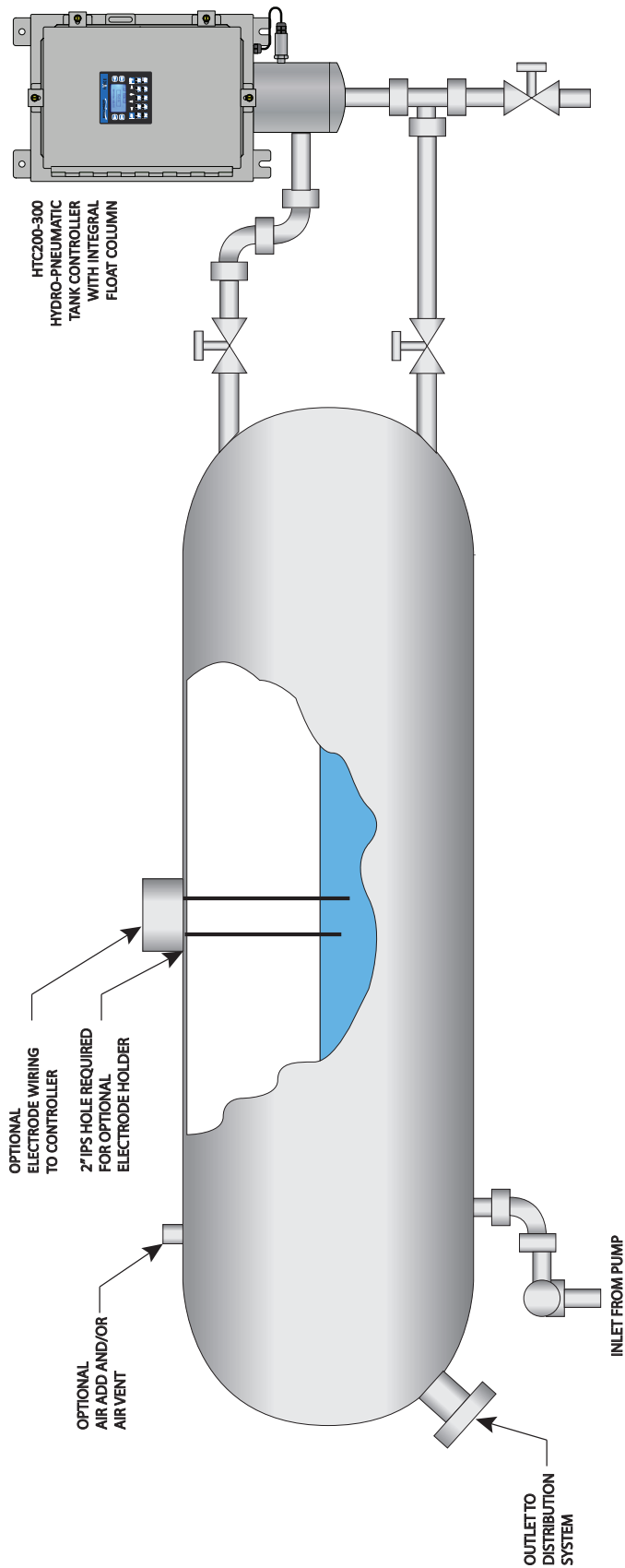
5. Example of how to change the SYSTEM PRESSURE variable

- 1 From the Main Menu Screen press **↓** until "SET POINT SCREEN" is highlighted, and then press **ENTER**.
- 2 "SYSTEM PRESSURE SET POINT" screen will appear, with the set point value displayed in a box on the screen. Press **ENTER**, the value will be become highlighted.
- 3 Use the **↑ ↓** keys or the numeric keypad to enter the desired pressure the system will be set for. Press **ENTER** to lock in value, the value will no longer be highlighted.
- 4 Press **F3** to exit and return to "Main Menu" screen.
- 5 "PRESSURE SCREENS" is highlighted. Press **ENTER**.
- 6 You are now at the "SYSTEM PRESSURE" screen.

6. Useful Data and Formulas

Water Data	Power Data
<p>Q = Flow, in GPM, CFS, etc. H = Head, Feet of Lift of Q</p> <p>1 MGD = 1 million gallons per day = 700 GPM</p> <p>1 ft³ = 1 cubic foot = 7.5 gallons</p> <p>1 cfs = 1 cubic foot per second = 450 GPM</p> <p>1 gallon water = 8.33 lbs</p> <p>Pressure</p> <p>1 Atmosphere = 14.7 P.S.I. = 34 feet H₂O = 29.92 inches</p> <p>Hg</p> <p>1 P.S.I. = 2.31 feet H₂O = 27.72 inches H₂O = 2.03 inches Hg</p> <p>1 foot w.c. = 1 foot H₂O = .432 P.S.I.</p> <p>1 inch w.c. = 1 inch H₂O = .036 P.S.I.</p>	<p>1 BTU = 1 British Thermal Unit = Heat Required to Raise Temperature of 1 lb. of water 1° F</p> <p>1 HP = 33,000 ft-lb/min. = 42.5 BTU/min. = 2545 BTU/hour = 746 Watts</p> <p>Pump HP = $\frac{\text{Water Hp}}{\text{Pump Eff}}$ = $\frac{\text{Water Hp}}{ep}$</p> <p>= $\frac{(\text{GPM}) \times H}{3,960 \times ep}$</p> <p>= $\frac{(\text{MGD}) \times H}{5.7 \times ep}$</p> <p>= $\frac{(\text{CFS}) \times H}{8.8 \times ep}$</p> <p>Water HP = $\frac{\text{GPM} (8.33 \text{ \#/Gal.} \times \text{feet lift})}{33,000 \text{ ft.\#/min.}}$</p> <p>= $\frac{(\text{GPM}) \times H}{3,960}$</p> <p>= $\frac{(\text{MGD} \times 700 \times 8.33) \times \text{feet lift}}{33,000}$</p> <p>= $\frac{(\text{MGD}) \times H}{5.07}$</p> <p>= $\frac{(\text{CFS} \times 450 \times 8.33) \times \text{feet lift}}{33,000}$</p> <p>= $\frac{(\text{CFS}) \times H}{8.8}$</p>

7. Installation Diagram



INSTALLATION NOTES:

This drawing shows both the electrode type and float column type of HTC and supplements the instruction manual.

Make a separate tank connection for air add and/or air vent line and the control pressure tap. Do not use a tee. Air add and air vent lines may be combined.

Installation of a vertical tank is the same.

FLOAT TYPE

- 1 Connect float column with 1" ips pipe, with the runs as short as possible.
- 2 Locate lower pipe tank connection about 1' above the tank bottom or above the sediment line. The connection should be away from the pump inlet and distribution outlet connections to prevent the float from being affected by turbulence.
- 3 Locate upper pipe close to tank top.
- 4 If column is separate from control enclosure, install pressure connection and wiring between column and control.

ELECTRODE TYPE (OPTIONAL)

- 1 Locate tip of shorter electrode at the level where the high water level is desired.
- 2 The longer electrode should be about 1" longer than the short electrode to eliminate false operation due to turbulence and to allow proper resetting.
- 3 To further avoid turbulence effects, the electrodes should not terminate near pump inlet and distribution outlet connections.

8. Panel and Chassis Layout

