



AquaServ™

System Administrator's Guide

v1.9

(Revision 1)

Author: D. R. Commander

Copyright ©2021 AquaSoft
All Rights Reserved

E-Mail: aquatic@aquaticservices.com
Web: <http://www.aquaticservices.com/aquaserv>

All trade names are trademarks or registered trademarks of their respective holders

AUDIENCE

This guide is intended for information technology professionals who will be installing, configuring, and administering AquaServ systems. Some familiarity with administering and configuring Microsoft Windows is assumed.

TYPOGRAPHIC CONVENTIONS

Literal text that appears on the computer screen is printed in *this font*.

Directions for accessing specific configuration pages in Windows Settings are abbreviated as:

Windows Settings → “*Category name*” → “*Tab or page name*” → [*“Additional link/gadget that may not be present in some versions of Windows 10 IoT”*] → “*Gadget name*”.

In the PDF version of this document, all cross-references to Sections, Chapters, Tables, and Figures are clickable. Click on the Section/Chapter/Table/Figure number to access the referenced page.

TABLE OF CONTENTS

Audience	ii
Typographic Conventions	ii
Table of Contents	iii
Tables	iii
CHAPTER 1– AquaServ Hardware	1
1.1– AquaServ Minimum System Requirements.....	1
1.2– Uninterruptible Power Supplies.....	3
1.3– Screen and Printer Resolution.....	3
1.3.1– Configuring the Screen Resolution.....	4
1.4– A/D Converter Hardware.....	5
1.4.1– Opto 22 (TCP).....	5
1.4.2– Opto 22 (Serial).....	6
CHAPTER 2– Operating System Considerations	7
2.1– AquaServ: An Embedded System.....	7
2.2– Power Management.....	7
2.3– Accessing the Operating System After AquaServ Is Installed.....	8
CHAPTER 3– Installing AquaServ	9
3.1– Installing AquaServ.....	9
3.2– Uninstalling AquaServ.....	11
3.3– Upgrading AquaServ.....	11
3.3.1– Adding More Inputs.....	11
APPENDIX A – AquaServ Specifications	13

TABLES

TABLE 1 - AquaServ 1000 Disk Space Requirements	2
TABLE 2 - AquaServ 2000 Disk Space Requirements	2
TABLE 3 - AquaServ 4000 Disk Space Requirements	2

1.1 – AquaServ Minimum System Requirements

AquaServ runs on top of Windows 10 IoT and is thus subject to the minimum system requirements for that operating system:

- 1 gigahertz (GHz) or faster 64-bit (x64) processor
- 2 gigabytes (GB) RAM
- Hard drive or solid state drive (SSD)
 - Windows requires 20 GB of available disk space
 - Additional disk space required for AquaServ will depend on how much data you need to store [See TABLE 1, TABLE 2, and TABLE 3]
- Graphics card or GPU compatible with DirectX 9
[See Section 1.3]
- Standard PC keyboard
- Standard 2-button mouse
- Digital flat-panel monitor
 - 21” or larger diagonal recommended if using a screen resolution larger than 1280 x 800 on a widescreen monitor.
 - 17” or larger diagonal recommended if using a screen resolution larger than 1024 x 768 on a non-widescreen monitor.

Additional Requirements/recommendations for AquaServ systems:

- One Ethernet port, or one RS-232 serial port (or USB-to-serial converter)
- **OPTIONAL:** One color inkjet or laser printer
[300 DPI or better resolution recommended—See Section 1.3]
- **RECOMMENDED:** Uninterruptible power supply (UPS)
[See Section 1.2]
- **RECOMMENDED:** USB flash drive
[Size will depend on how much data you wish to back up—
See TABLE 1, TABLE 2, and TABLE 3]
- **RECOMMENDED:** Three available Universal Serial Bus (USB) ports (one for the printer, one for the UPS, and one for the flash drive)

TABLE 1 - AquaServ 1000 Disk Space Requirements

Amount of Stored Data									
Sampling Interval	1 wk.	1 mo.	2 mo.	3 mo.	6 mo.	1 yr.	2 yrs.	3 yrs.	5 yrs.
5 sec. (default)	3.5 MB	15 MB	31 MB	45 MB	91 MB	181 MB	361 MB	542 MB	903 MB
10 sec.	1.7 MB	7.7 MB	15 MB	23 MB	45 MB	90 MB	181 MB	271 MB	452 MB
15 sec.	1.2 MB	5.1 MB	10 MB	15 MB	30 MB	60 MB	120 MB	181 MB	301 MB
30 sec.	0.58 MB	2.6 MB	5.1 MB	7.6 MB	15 MB	30 MB	60 MB	90 MB	151 MB
1 min.	0.29 MB	1.3 MB	2.6 MB	3.8 MB	7.6 MB	15 MB	30 MB	45 MB	75 MB
2 min.	0.14 MB	0.64 MB	1.3 MB	1.9 MB	3.8 MB	7.5 MB	15 MB	23 MB	38 MB
5 min.	0.06 MB	0.26 MB	0.51 MB	0.76 MB	1.5 MB	3.0 MB	6.0 MB	9.0 MB	15 MB
10 min.	0.03 MB	0.13 MB	0.26 MB	0.38 MB	0.76 MB	1.5 MB	3.0 MB	4.5 MB	7.5 MB
15 min.	0.02 MB	0.09 MB	0.17 MB	0.25 MB	0.51 MB	1.0 MB	2.0 MB	3.0 MB	5.0 MB
30 min.	0.01 MB	0.04 MB	0.09 MB	0.13 MB	0.25 MB	0.50 MB	1.0 MB	1.5 MB	2.5 MB

(1 MB = 1 Megabyte = 1,048,576 bytes)

TABLE 2 - AquaServ 2000 Disk Space Requirements

Amount of Stored Data									
Sampling Interval	1 wk.	1 mo.	2 mo.	3 mo.	6 mo.	1 yr.	2 yrs.	3 yrs.	5 yrs.
5 sec. (default)	6.3 MB	28 MB	56 MB	83 MB	167 MB	332 MB	663 MB	993 MB	1656 MB
10 sec.	3.2 MB	14 MB	28 MB	42 MB	83 MB	166 MB	331 MB	497 MB	828 MB
15 sec.	2.1 MB	9.4 MB	19 MB	28 MB	56 MB	111 MB	221 MB	331 MB	552 MB
30 sec.	1.1 MB	4.7 MB	9.4 MB	14 MB	28 MB	55 MB	110 MB	166 MB	276 MB
1 min.	0.53 MB	2.3 MB	4.7 MB	6.9 MB	14 MB	28 MB	55 MB	83 MB	138 MB
2 min.	0.26 MB	1.2 MB	2.3 MB	3.5 MB	6.9 MB	14 MB	28 MB	41 MB	69 MB
5 min.	0.11 MB	0.47 MB	0.94 MB	1.4 MB	2.8 MB	5.5 MB	11 MB	17 MB	28 MB
10 min.	0.05 MB	0.23 MB	0.47 MB	0.69 MB	1.4 MB	2.8 MB	5.5 MB	8.3 MB	14 MB
15 min.	0.04 MB	0.16 MB	0.31 MB	0.46 MB	0.93 MB	1.8 MB	3.7 MB	5.5 MB	9.2 MB
30 min.	0.02 MB	0.08 MB	0.16 MB	0.23 MB	0.46 MB	0.92 MB	1.8 MB	2.8 MB	4.6 MB

(1 MB = 1 Megabyte = 1,048,576 bytes)

TABLE 3 - AquaServ 4000 Disk Space Requirements

Amount of Stored Data									
Sampling Interval	1 wk.	1 mo.	2 mo.	3 mo.	6 mo.	1 yr.	2 yrs.	3 yrs.	5 yrs.
5 sec. (default)	12 MB	54 MB	107 MB	159 MB	318 MB	633 MB	1265 MB	1896 MB	3161 MB
10 sec.	6.1 MB	27 MB	54 MB	80 MB	159 MB	317 MB	632 MB	948 MB	1581 MB
15 sec.	4.0 MB	18 MB	36 MB	53 MB	106 MB	211 MB	422 MB	632 MB	1054 MB
30 sec.	2.0 MB	8.9 MB	18 MB	27 MB	53 MB	106 MB	211 MB	316 MB	527 MB
1 min.	1.0 MB	4.5 MB	8.9 MB	13 MB	27 MB	53 MB	105 MB	158 MB	263 MB
2 min.	0.50 MB	2.2 MB	4.5 MB	6.6 MB	13 MB	26 MB	53 MB	79 MB	132 MB
5 min.	0.20 MB	0.89 MB	1.8 MB	2.7 MB	5.3 MB	11 MB	21 MB	32 MB	53 MB
10 min.	0.10 MB	0.45 MB	0.89 MB	1.3 MB	2.7 MB	5.3 MB	11 MB	16 MB	26 MB
15 min.	0.07 MB	0.30 MB	0.60 MB	0.88 MB	1.8 MB	3.5 MB	7.0 MB	11 MB	18 MB
30 min.	0.03 MB	0.15 MB	0.30 MB	0.44 MB	0.88 MB	1.8 MB	3.5 MB	5.3 MB	8.8 MB

(1 MB = 1 Megabyte = 1,048,576 bytes)

1.2 – Uninterruptible Power Supplies

An Uninterruptible Power Supply (UPS) is a device that contains electrical power conditioning equipment and a large battery. A UPS plugs into a standard electrical outlet and provides additional outlets for plugging in computers and other electronic equipment that you wish to protect. When the electrical power coming from the outlet is within an acceptable range, the UPS is inactive and will use that power to recharge its internal battery. When the electrical signal coming from the outlet experiences a spike, surge, low voltage condition, phase shift, or other anomaly, then the UPS will use its internal circuitry to correct the flaw in the power signal before it reaches your equipment. The UPS also uses its battery to provide uninterrupted power to your equipment during brief power outages (usually up to 15 or 30 minutes, depending on how much power the equipment is using and the size of the battery.)

When choosing an uninterruptible power supply (UPS), it is recommended that you choose one with a Volt-Amp (VA) rating of at least 1.8 times the maximum power intake of all of the equipment that will be connected to the battery. For example, if your computer has a 200 Watt power supply, at least a 360 VA UPS is needed. Likewise, a 230 Watt power supply would require at least a 420 VA UPS, etc. A larger UPS would be required if additional equipment, such as the monitor and printer, is also connected to the battery. UPS models ranging from 320 VA to well over 1000 VA are readily available at retail electronics and computer stores at very reasonable prices.

Most UPSs have two sets of plugs: a set that is backed by the internal battery (thus providing uninterrupted power) and a set that provides surge protection only. In most cases, it is recommended that you plug only the computer and A/D converter equipment into the battery-backed set of plugs and plug other equipment (such as the monitor and printer) into the non-battery-backed plugs. If the power goes out, then the transmitter supplying the input signal to the AquaServ system will probably go out as well. If the transmitter goes out, then the AquaServ system is rendered useless, so there is no need to run the monitor and printer during the power outage (which would cause the UPS battery to drain more quickly.) The UPS's main purpose is to prevent the AquaServ system from rebooting during power outages that last only a few seconds or minutes and to protect it against electrical surges and spikes.

Many UPSs come with a software program that runs in the background and monitors the amount of battery power left in the UPS. Those that don't come with such a program usually include instructions on how to use the built-in UPS service in Windows to monitor the UPS. It is recommended that you configure some form of software UPS monitoring prior to installing AquaServ, since this will ensure that Windows shuts down cleanly if the battery power becomes too low to run the AquaServ system.

1.3 – Screen and Printer Resolution

AquaServ supports any video card, monitor, and printer that Windows supports, including widescreen (16:9 aspect ratio) flat-panel displays. It is recommended that you use a screen resolution of at least 1024 x 768 pixels (or 1280 x 800 pixels on a widescreen monitor) with AquaServ.

The horizontal screen resolution determines the smallest period of time that AquaServ's display is able to accurately represent, referred to as its “temporal resolution.” The temporal resolution for the

AquaServ display is:

$$\frac{86400}{w \cdot 0.75} \text{ seconds}$$

where w is the screen width in pixels. For example, a 1024 x 768-pixel screen is capable of displaying changes in the input signals that occurred 113 seconds apart. Higher screen resolutions have better temporal resolution. For instance, a 1920 x 1200 wide-screen display would be capable of displaying changes in the input signals that occurred 60 seconds apart.

The vertical screen resolution determines the smallest change in the input signals that AquaServ's display is able to accurately represent, referred to as its "signal resolution". The signal resolution for the AquaServ display is approximately:

$$\frac{100}{(h - 47) \cdot 0.94} \text{ percent}$$

where h is the screen height in pixels. For example, a 1024 x 768-pixel screen is capable of displaying changes in the input signals that are within 0.15% of full scale.

The resolution of AquaServ's printouts is determined by the resolution of the printer (expressed in "dots per inch", or DPI.) The temporal resolution of AquaServ's printouts is:

$$\frac{86400}{dpi \cdot 8.25} \text{ seconds}$$

where dpi is the printer resolution in dots per inch. For example, a 600 DPI printer is capable of displaying changes in the input signals that occurred 17 seconds apart. Printer resolutions greater than 600 DPI will generally not produce any further visible benefit, due to limitations in the resolving power of the human eye.

The signal resolution of AquaServ's printouts is approximately:

$$\frac{100}{dpi \cdot 7.1} \text{ percent}$$

where dpi is the printer resolution in dots per inch. For example, a 600 DPI printer is capable of displaying changes in the input signals that are within 0.023% of full scale. This may exceed the accuracy of the A/D converter hardware, depending on the type of converter used. For instance, using a printer with more than 600 DPI of resolution would have no benefit with a 12-bit A/D converter, since these converters are only accurate to within 0.03% of full scale.

1.3.1 – Configuring the Screen Resolution

- Access
Windows Settings → "System" → "Display" → ["Advanced display settings"] → "Resolution".
- Select the screen resolution that you wish to use from the drop-down list.

1.4 – A/D Converter Hardware

1.4.1 – Opto 22 (TCP)

Opto 22 (<http://www.opto22.com>) manufactures a variety of modular, industrial-grade data acquisition products that can communicate with a PC using various serial and network protocols. The SNAP series, in particular, allows mixing and matching of different controllers (“brains”), I/O modules, and module racks to suit a specific purpose. Opto 22 manufactures analog I/O modules that can produce a digital signal from a variety of analog signal standards, including 20 mA, 1 mA, 50 mV, and ICTD-compliant temperature probe output. These modules can be plugged into an existing rack to easily expand the number of available inputs, and they are available with full optical isolation between inputs. AquaServ supports any of Opto 22's Ethernet brains that use the OptoMMP protocol. The SNAP-PAC-EB2 has been specifically tested.

By default, AquaServ is configured such that it will communicate with an Opto22 Ethernet brain that is listening on the following IP address and port:

IP Address	192.168.1.150
IP Port	2001

However, you can change this in the [Plant Setup: Configure Inputs](#) menus in AquaServ. You can set the IP address and IP port independently for each AquaServ input, thus allowing different inputs to be mapped to different Opto 22 brains. To change the IP address on which the brain listens, connect it to the AquaServ computer using a Cat 5 crossover cable or an Ethernet switch, then install and run the Ethernet IP Configurator. The Ethernet IP Configurator ships with new Opto 22 Ethernet brains and is also available as a free download from Opto 22's web site.

For standalone installations, in which the AquaServ computer and the Opto 22 Ethernet brain will communicate with each other but not with an outside network, then both devices can be assigned different static IP addresses from the range of 192.168.1.1 through 192.168.1.254. For instance, you can configure the brain to listen on 192.168.1.150 and the computer to listen on 192.168.1.200. The IP address of the AquaServ computer can be configured by accessing

Windows Settings → “*Network & Internet*” → “*Status*” → “*Network and Sharing Center*” → “*Change adapter settings*” → “*Ethernet*” (double-click) → “*Properties*” button → “*Internet Protocol Version 4 (TCP/IPv4)*” (double-click).

Click “Use the following IP address”, enter the desired IP address for the AquaServ computer into the “IP address” field, and enter “255.255.255.0” for the Subnet mask (leave “Default gateway” blank.) Click “OK” twice, then click “Close”.

1.4.2 – Opto 22 (Serial)

AquaServ also supports any of the legacy Opto 22 brains that use the mistic or Optomux serial protocols. Specifically, it has been tested with the B3000. AquaServ can communicate with multiple brains on the same RS-485 loop, as long as the brains all use the same protocol (mistic or Optomux) and are configured to use different addresses. An RS-232 to RS-485 converter is used to connect the AquaServ computer to the RS-485 loop. Since the AquaServ computer is communicating with the Opto 22 brain using RS-485, the brain can be located as much as 4000 feet away from the computer.

Depending on the protocol used, the Opto 22 brain should be configured as follows:

	<i>mistic Protocol</i>	<i>Optomux Protocol</i>
Baud Rate	115200	38400
Binary/ASCII	Binary	ASCII
Data Verification	CRC16	Checksum

2.1 – AquaServ: An Embedded System

Most Windows-based industrial process control (IPC) software relies on an external piece of hardware— usually a Programmable Logic Controller (PLC)— to handle time-critical tasks such as sampling data and totalizing flow. Typically, the Windows software portion of these systems is simply a HMI (Human-Machine Interface) to the external hardware. These systems are usually quite costly and complicated to set up and use.

AquaServ is not meant to compete with these high-end IPC systems. Rather, it is a self-contained chart recorder and data acquisition system that uses software to perform some of the functions that might normally be performed by a PLC. The AquaServ software runs on PC hardware and Windows because that platform is inexpensive and widely available. However, once AquaServ is installed on a PC, that PC ceases to be a general-purpose computer. It instead becomes an “embedded system.” An embedded system is a single-purpose device built on top of general-purpose hardware and software. Cable TV set-top boxes are an example of embedded systems, as are the cash registers at most supermarkets. These devices use hardware that is the same or similar to PC hardware, but even though some of these embedded systems might run Windows, they cannot be used as Windows PCs.

Since AquaServ must handle the time-critical functions of a PLC as well as act as a HMI and data acquisition system, it needs to have exclusive control of the computer at all times. In a complex operating system, such as Windows, that is capable of running more than one program at a time, other programs could steal CPU time away from AquaServ, thus affecting its temporal accuracy. The AquaServ installer can optionally convert the PC into an embedded system, which involves disabling Windows Explorer and unneeded Windows features and services (see Section 3.1.) This is the recommended way of running AquaServ, since it will ensure that no background processes can compromise the stability or performance of the system.

2.2 – Power Management

AquaServ automatically creates a new power plan called “AquaServ” with the following settings:

- Pressing the computer's power button will shut down Windows and then power off the system. You can also hold down the power button for more than 4 seconds to power off the system without shutting down Windows, but this should be done only in the case of a system lock-up or other situation in which the system cannot be shut down normally.
- If the computer has a Sleep button, it is disabled, and the computer is prevented from going to sleep or hibernating during periods of inactivity.
- The hard drives are prevented from going to sleep when the system is idle.

AquaServ also allows you to configure whether or not the display should be automatically powered off during periods of inactivity. This is configured in the [Plant Setup: Hardware](#) menu.

AquaServ also provides a regular screen blanker, which prevents monitor burn-in but does not power down the display. See the AquaServ User's Guide for further details.

2.3 – Accessing the Operating System After AquaServ Is Installed

When the PC is converted into an embedded system, AquaServ will start whenever the computer boots up. The computer is effectively locked down while AquaServ is running, which prevents anyone from running any other programs. AquaServ provides interfaces that can be used to select the default printer, change display power management settings, and adjust the system date and time. From time to time, however, it may be necessary to access the operating system for other maintenance tasks, such as changing the display resolution or upgrading the AquaServ software. To do this, bring up either the [Plant Setup](#) or the [Calibration](#) menu and type the word “quit”. Click “Yes” when prompted. When AquaServ exits, you will see a blank screen. Perform the following procedure to start Windows Explorer:

- Press Ctrl, Alt, and Delete simultaneously.
- Click “Task Manager.”
- In the “Task Manager” window, click the “More details” button at the bottom of the window, if it exists.
- Select “Run new task” from the “File” menu.
- In the “Create new task” dialog, enter “explorer” and click “OK”.

The Windows desktop, taskbar, and Start Menu should now appear. You can now close the Task Manager window.

Once you have finished performing maintenance on the AquaServ computer, restart the computer to bring up AquaServ again.

3.1 – Installing AquaServ

AquaServ is distributed as an installer program, which is named

`aquaserv-1000-install.exe`,
`aquaserv-2000-install.exe`,
or
`aquaserv-4000-install.exe`,

depending on which version of AquaServ you purchased. This installer may have been provided to you on a CD, a USB flash drive, or as a download from the AquaServ web site.

- Depending on the configuration of Windows 10 IoT, it may automatically log into an account with administrative privileges whenever the system starts. If this is not the case, however, then you will need to enable automatic logon before installing AquaServ.
- Using Windows Explorer, open the drive or directory containing the AquaServ installer. This may be the CD or USB flash drive you received, or it may be a directory to which you downloaded the AquaServ installer from the web.
- Open the AquaServ installer program.

The installer works like most Windows installers. The first screen asks you to accept a standard End User License Agreement (EULA.) The next screen contains a list of install options, described in detail below.

- **Convert PC into AquaServ Embedded System**

This enables or disables the options below. The options can also be enabled/disabled individually.

- 1. Disable Windows Defender**

Windows Defender is an antivirus program included with Windows 10 IoT. It performs background virus scans that can steal valuable system resources away from AquaServ. Windows Defender is unnecessary on standalone AquaServ systems, since they are not connected to an outside network.

- 2. Start AquaServ when system starts**

This option installs a startup task that launches AquaServ whenever any user logs in (since automatic logon is enabled, this has the effect of launching AquaServ whenever Windows starts.) This option also disables Windows Explorer, so no other programs can start while AquaServ is running. Refer to Section 2.3 for instructions on how to exit AquaServ and temporarily re-enable Windows Explorer for system maintenance purposes.

3. Disable AutoPlay

This option prevents Windows from automatically launching an application when a CD or DVD is inserted.

4. Disable automatic System Restore point creation

This option prevents Windows from creating periodic snapshots of the filesystem (“restore points.”) These snapshots use up a great deal of disk space and serve no purpose as long as the system is being used solely for AquaServ.

5. Disable automatic Windows updates

The Windows Update service normally runs in the background, downloading and installing operating system patches from Microsoft's web site (if the computer is connected to the Internet.) Even if the computer isn't connected to the Internet, Windows Update can still steal valuable system resources away from AquaServ, so it is strongly recommended that you disable automatic updates and install operating system patches manually on an as-needed basis (note that it should not generally be necessary to patch the operating system unless the AquaServ computer is on a network.)

6. Disable Customer Experience Improvement Program

This option disables a handful of background tasks that attempt to periodically contact Microsoft's servers and send information about the computer. Although these tasks supposedly do nothing unless the computer has been opted into Microsoft's Customer Experience Improvement Program, running them needlessly wastes system resources when the system is being used solely for AquaServ.

7. Disable Offline Files service

The Offline Files service synchronizes files from the network to the local hard drive so that they can be accessed when the computer is disconnected from the network. It serves no purpose as long as the system is being used solely for AquaServ.

8. Disable unneeded Windows 10 IoT maintenance tasks

This disables a handful of background tasks that serve no purpose as long as the system is being used solely for AquaServ.

9. Disable Superfetch service

The Superfetch service monitors application usage patterns and preloads frequently-used applications into memory, in order to speed up application load times. This wastes valuable CPU and memory resources and serves no purpose as long as the system is being used solely for AquaServ.

10. Disable unneeded Windows 10 IoT features

This option disables features like Windows Search, Windows Media Player, and other applications and services that waste system resources and serve no purpose as long as the

system is being used solely for AquaServ.

- **Configure Screen Resolution**

This will open the “Display” applet in Windows Settings, allowing you to set the screen resolution to an appropriate values (see Section 1.3.)

The AquaServ software installs to a directory named `aquaserv` on the same drive on which Windows is installed (usually `c:`).

3.2 – Uninstalling AquaServ

To uninstall AquaServ, select the “Uninstall AquaServ” link in the “AquaServ” program group under the Windows Start Menu. This will automatically remove the AquaServ startup task, if AquaServ was configured to start when the system starts.

Note that uninstalling AquaServ removes only the AquaServ program. Any chart data or configuration files are left in tact in the `c:\aquaserv` directory.

The AquaServ installer creates a System Restore point called “AquaServ”, which can be used to remove all of the embedded system modifications described above and convert the PC back into a normal PC. If you intend to restore the system using this restore point, then you should do so prior to uninstalling AquaServ (otherwise, you will need to uninstall AquaServ again after restoring the system.)

3.3 – Upgrading AquaServ

From time to time, updates of the AquaServ software will be released in order to add features and fix bugs. These software updates can be obtained from Aquatic Services.

Upgrading the AquaServ software is also necessary if you wish to convert your system from an AquaServ 1000 (4-input) system to an AquaServ 2000 (8-input) or 4000 (16-input) system or to convert your system from an AquaServ 2000 system to an AquaServ 4000 system.

Upgrading AquaServ works the same as installing AquaServ. The only difference is that the installer will detect that a previous version of the AquaServ software is already installed and will ask you to confirm that you wish to replace it with the new version.

3.3.1 – Adding More Inputs

If you are upgrading from AquaServ 1000 to AquaServ 2000, from AquaServ 2000 to AquaServ 4000, or from AquaServ 1000 to AquaServ 4000, then your existing data files will be expanded to accommodate the new number of inputs (8 or 16.) Your existing totalizer files will also be expanded, so you should receive a message saying “4 totalizers restored” or “8 totalizers restored”

upon loading AquaServ 2000 or 4000 for the first time. All configuration information for existing inputs will be preserved during the upgrade, and the new inputs will start out with factory default settings. So, for example, if you were upgrading from AquaServ 1000 to 2000, you would not need to change any settings for Inputs 1-4 following the upgrade.

WORD OF CAUTION:

If you are using almost all of the disk space on your existing system, then there may not be enough room to expand your existing data files to accommodate more inputs. Before upgrading to a larger number of inputs, you should consult TABLE 1, TABLE 2, or TABLE 3 to see how much disk space will be required to store the number of days of data that you wish to store. If your hard drive is 10 GB or larger, then this should not be an issue unless you wish to store considerably more than 5 years of data. The amount of free disk space is always listed in the [Plant Setup: Data Acquisition](#) menu.

APPENDIX A – AQUASERV SPECIFICATIONS

A/D CONVERTER:	<p>Opto 22 SNAP I/O Controllers:</p> <ul style="list-style-type: none"> • 16 bits per sample • 20,000 levels of resolution, 0.005% maximum quantization error (when used with 4-20 mA field inputs) • Ethernet: <ul style="list-style-type: none"> ▶ 300-foot maximum distance between PC and controller (can be extended using Ethernet switches) • Serial: <ul style="list-style-type: none"> ▶ Interfaces to PC serial port with RS-485 to RS-232 converter at 38,400 bits/second (Optomux) or 115,200 bits/second (mistic) ▶ 4000-foot maximum distance between PC and controller 				
TEMPORAL ACCURACY:	<p><u>ADC polling interval:</u> 0.1 seconds</p> <p><u>Real-time totalizer:</u> Updated every 1/10 second</p> <p><u>Active Virtual Chart:</u> Updated every 5 seconds</p> <p><u>Data Acquisition:</u> Data stored to disk every 5-1800 seconds (default: every 5 seconds)</p> <p>Temporal resolution of chart:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 5px; text-align: center;"> $\frac{86400}{w \cdot 0.75} \text{ seconds}$ <p>where <i>w</i> is the screen width in pixels</p> <p><i>Example:</i> 90 seconds on a 1280x720 display</p> </td> <td style="padding: 5px; text-align: center;"> $\frac{86400}{dpi \cdot 8.25} \text{ seconds}$ <p>where <i>dpi</i> is the resolution of the printer in dots per inch</p> <p><i>Example:</i> 17 seconds on a 600 DPI printer</p> </td> </tr> </table> <p>Signal resolution of chart:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 5px; text-align: center;"> $\frac{100}{(h - 47) \cdot 0.94} \text{ percent}$ <p>where <i>h</i> is the screen height in pixels</p> <p><i>Example:</i> 0.16% of full scale on a 1280x720 display</p> </td> <td style="padding: 5px; text-align: center;"> $\frac{100}{dpi \cdot 7.1} \text{ percent}$ <p>where <i>dpi</i> is the resolution of the printer in dots per inch</p> <p><i>Example:</i> 0.023% of full scale on a 600 DPI printer</p> </td> </tr> </table>	$\frac{86400}{w \cdot 0.75} \text{ seconds}$ <p>where <i>w</i> is the screen width in pixels</p> <p><i>Example:</i> 90 seconds on a 1280x720 display</p>	$\frac{86400}{dpi \cdot 8.25} \text{ seconds}$ <p>where <i>dpi</i> is the resolution of the printer in dots per inch</p> <p><i>Example:</i> 17 seconds on a 600 DPI printer</p>	$\frac{100}{(h - 47) \cdot 0.94} \text{ percent}$ <p>where <i>h</i> is the screen height in pixels</p> <p><i>Example:</i> 0.16% of full scale on a 1280x720 display</p>	$\frac{100}{dpi \cdot 7.1} \text{ percent}$ <p>where <i>dpi</i> is the resolution of the printer in dots per inch</p> <p><i>Example:</i> 0.023% of full scale on a 600 DPI printer</p>
$\frac{86400}{w \cdot 0.75} \text{ seconds}$ <p>where <i>w</i> is the screen width in pixels</p> <p><i>Example:</i> 90 seconds on a 1280x720 display</p>	$\frac{86400}{dpi \cdot 8.25} \text{ seconds}$ <p>where <i>dpi</i> is the resolution of the printer in dots per inch</p> <p><i>Example:</i> 17 seconds on a 600 DPI printer</p>				
$\frac{100}{(h - 47) \cdot 0.94} \text{ percent}$ <p>where <i>h</i> is the screen height in pixels</p> <p><i>Example:</i> 0.16% of full scale on a 1280x720 display</p>	$\frac{100}{dpi \cdot 7.1} \text{ percent}$ <p>where <i>dpi</i> is the resolution of the printer in dots per inch</p> <p><i>Example:</i> 0.023% of full scale on a 600 DPI printer</p>				