2010

TS-3000i® Automatic Web-Based TimeSync Clock

Joe Nocella

Amano

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Introduction

Time synching clocks are used by companies that either have regulatory requirements or need validated time for their business processes. Synchronizing time is a key business and technology decision that should be integrated within an effective network and security architecture. Regulatory issues exist where transactions and changes to electronic records should be accurately time-stamped. In order to provide this accuracy, all network devices must be synchronized according to national and international time standards.

The current time-stamp designs entail serial or parallel connections, software, wiring, cabling, line drivers, patch panels, splitters, and repeaters. While current designs were standard back in the late 90s, advancement in technology and lower component costs have outdated this model. Why?

- Loss in real-time communications capabilities, which cause a significant increase in network traffic and wasted processor cycles on the server.

- Proprietary software which must be used to configure the clock adds to installation complexity and significant increase in support.

- Requirement for dedicated servers for processing which escalates the installation cost.

- Maximized IT staff involvement, which is not advantageous when it comes to compliance initiatives.

Amano's innovative TS-3000i turn-key web based clock provides users with automatic time synchronization for validated time. This clock will run on its own by employing easy-to-use resident time synchronization schedules with a back-up system that sends e-mail notification and SNMP trap alerts. It also generates time sync reports on events for a potential audit. The TS-3000i will provide the end user with savings in time, effort and money!

Time Sensitive Applications

Applications for – Certified Time Markets: where the key is **"No need for an intermediate server" which saves your company money**. The following applications could benefit:

- **Hospitals**: For cardiac arrest, cardiopulmonary resuscitation, and nursing stations. Time of events is crucial especially for quality improvements, research and medico-legal issues. Also, patient records should have their time based on the signal transmitted from the NIST or NTP server. Patient information records or files would then be time/date stamped from a validated synchronized time source. This would mitigate errors in treatments based on lab tests, imaging, medications and/or treatments.

  A Chest Pain Center is a hospital emergency center accredited by the international Society of Chest Pain Centers. Protocols at each center include treating a heart attack within 70 minutes and performing a cardiac catheterization within 90 minutes of the patient's arrival at the center. The time it takes to diagnose a heart attack and complete angioplasty procedure is referred to as "*door to balloon*" time.

- **Pharmaceutical/Healthcare**: FDA 21 CFR Part 11; Electronic Records/Signatures Time Stamps. A component of FDA 21 CFR Part 11 is the Time Stamp Guidance Docket OOD-1542, which requires an accurate time stamp for every log. The TS-3000i provides a physical time stamp on paper that is traceable back to the NIST or NTP server.

- **Wealth Management Firms**: Require validated synchronized time. To prevent illegally backdating stock options.

- **Casinos**: NGC Reg. 6.090 (9) requires sports book terminal winning tickets must be date/time stamped. Race and sports books must contact the Naval Observatory Master Clock to verify the correct time each day events are held and wagers accepted. The date and starting time of the event/race per the results report are compared to the date and timestamp on the ticket versus the computer sales/transaction report.

- **Manufacturing Companies**: Record Bills of Lading documents issued by the carrier to a shipper acknowledging that goods have been received. Also, for batch processing where accurate time for work-in process flow would benefit from the synchronized timestamp of the TS-3000i.

The TS-3000i assures financial institutions compliance with OATS Rule 7430 as per FINRA/SEC (formerly NASD OATS Rule 6953 & NYSE Rule 132A), Synchronization of Member Business Clocks as described in the following;

Rule 7430 requires any Financial Industry Regulatory Authority (FINRA) member firm that records order, transactions or related data required under the By-Laws and Rules of the Association to synchronize all business clocks used to record the date and time of any market event. Clocks, including computer system clocks and manual time stamp machines, must record time in hours, minutes and seconds with to-the-second granularity and must be synchronized to a source that is synchronized to within three seconds of the National Institute of Standards and Technology (NIST) atomic clock. Clocks must be synchronized once a day prior to the opening of the market, and remain in synch throughout the day. In addition, firms are to maintain a copy of their clock synchronization procedures onsite. Clocks not used to record the date and time of market events need not be synchronized.

Compliance is: "*Cost of doing Business*". Companies that are governed by regulatory requirements look for the best innovative technology solution, which allows them to meet these requirements with minimal manual effort, low cost to create timely solutions. The key's are: *Accuracy-Timeliness-Automation*. The TS-3000i also provides a solution for industry sectors that require strict adherence to good time keeping practices.

The Amano TS-3000i web-based "plug n' play" time clock provides the following benefits:
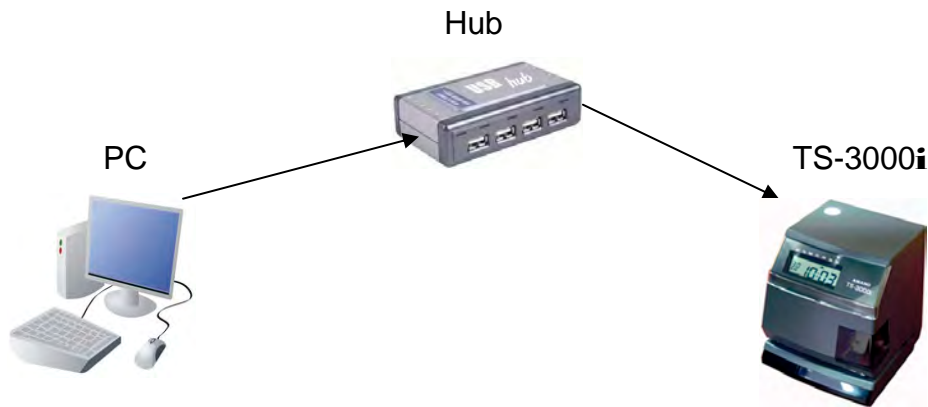
- **No server/desktop software required**

- **No central management**

- **Minimal IT staff involvement**

- **Simplifies the work for a system administrator**

- **Quick and simple install**

- **Maintain time ± 4/10 of a sec. over a 24 hr. period once synchronized**

- **Prints through up to 6 multiple-part carbonless copies**

- **Optional FPR (Full Power Reserve) permits clock operation and/or stamping in the event of a power outage**

- **Optional PoE (Power over Ethernet) accessory with FPR eliminates AC power requirement**

- **Compatible with most web browsers**

- **E-mail notification of clock status and/or failure to synchronize the time, which is configurable to send e-mail notification to chosen recipients.**

- **Print individual reports via web browser or centralized reporting via TS-3000i Utility software.**

- **Event notification through SNMP traps. This feature enables network administrators to centrally manage time clocks performance, locate problems and solve them in a timely manner.**

- **Effectively manage up to 32 separate internal and external Network Time Protocol (NTP) time servers**

- **Sync every 2 hrs for improved accuracy. This will provide up to 12 time validations per day with the storage capacity of up to 5 years of time sync data. (Note: 5 yr. storage capacity is based on normal sync schedule of 2 syncs/day)**

- **Control user security through Login Username/Password**

- **Includes TS-3000i Utility CD with enhanced features to;**
  - ✓ **Browse multiple domains for clock discovery**
  - ✓ **Clock monitoring which displays on-line and off-line clocks, and provides email of off-line clocks.**
  - ✓ **Reset clock to factory default command**
  - ✓ **Simplified procedure to get configuration and transaction clock files**

System Architecture

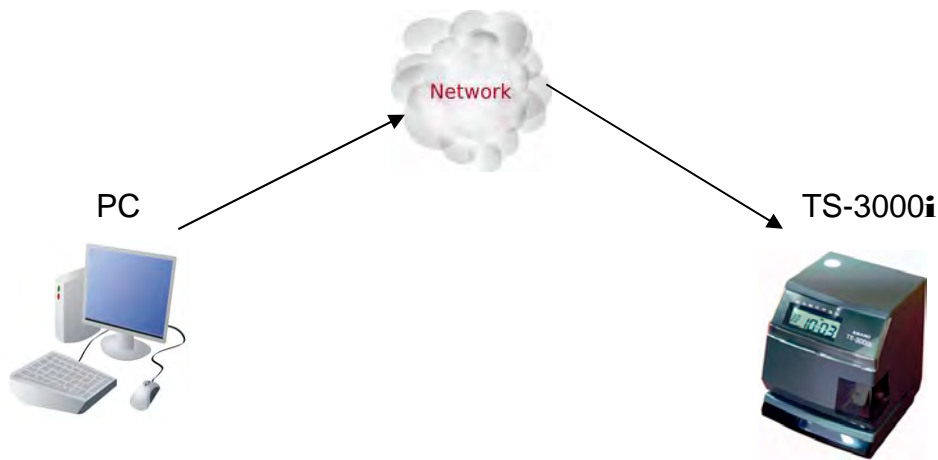The TS-3000i can integrate into the end users network infrastructure in a variety of ways:

✓ *As a Stand-alone*: Designed for companies who require a low quantity of clocks and have a simple network infrastructure.

Scenario 1: The end user would use a hub which would connect Ethernet devices together and make them act as a single network segment.

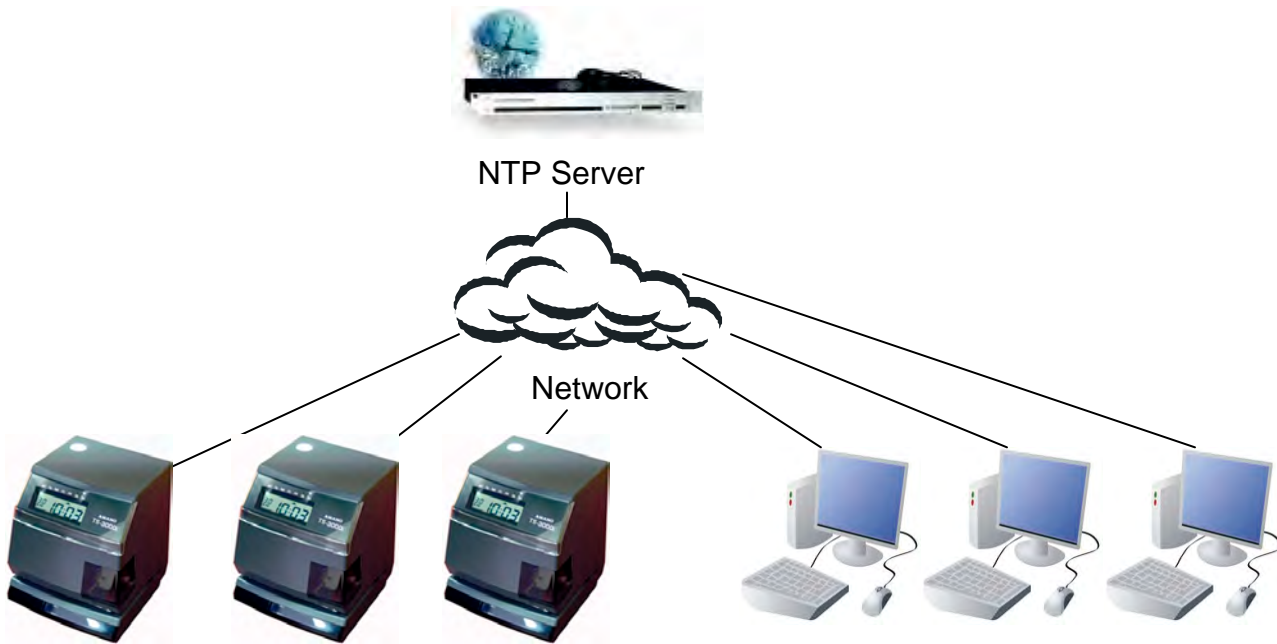Hub

PC   TS-3000i

The hub is a device that joins clocks together on one network. There are many types of hubs, but the most common one is an Ethernet. This type of hub can be used to connect clocks without Internet connection. If you require Internet connection for the clocks, you must add a router or switch.

Scenario 2: The end user would connect directly to their network.
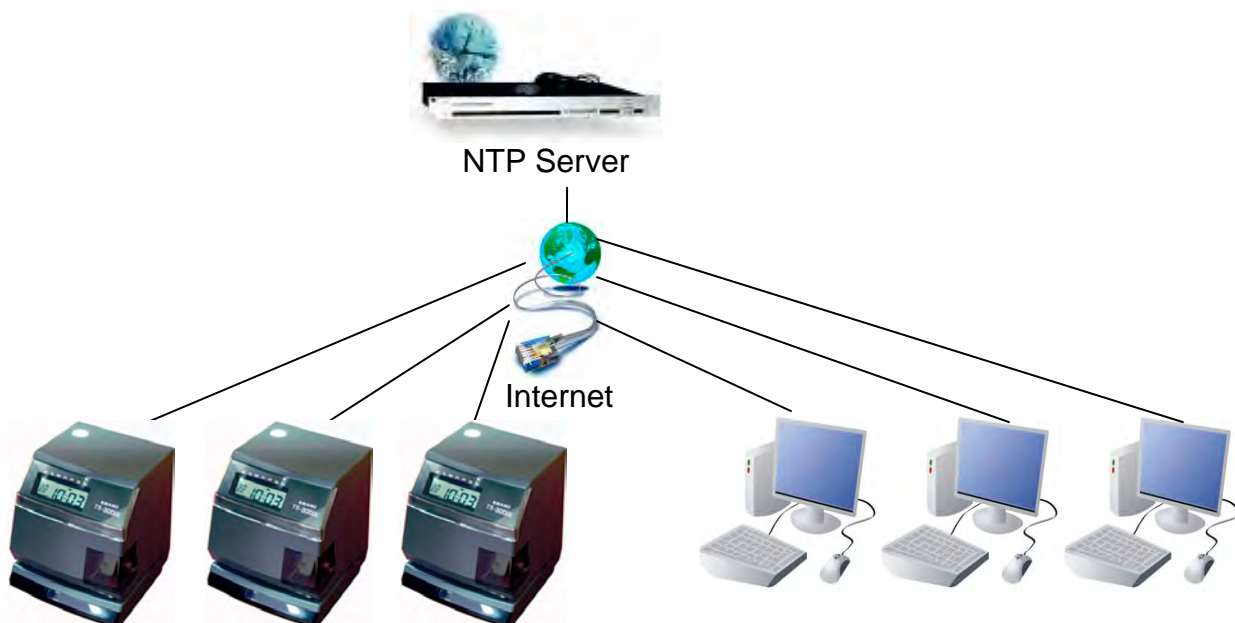
Network

PC   TS-3000i

✓ *As a Server Integrated*: Designed for companies that require multiple clocks. They could connect to the NTP (Network Time Protocol) server through their own network or via the Internet. NTP is a protocol designed to synchronize the time on a TS-3000i and networks LANS/WANS across the Internet. An NTP time server is used to obtain the correct time from a time source and adjust the local time in each connected TS-3000i.

NTP Server

Network

OR

The NTP server uses UDP port 123 which must be open if connection via the Internet is required.

NTP Server

Internet

Synchronization is vital for any network that conducts time sensitive transactions. The TS-3000i uses the time as a point of reference between events. If they are all on a network running off different time, then problems could occur. UTC (coordinated universal time) is a global timescale used all over the world ensuring that all networks linked to a UTC time source are running identical times.

Some end-users are reluctant to obtain UTC through the Internet due to security issues as the firewall needs to be open to receive the signal. A dedicated network time server can be legally audited which means in case of fraud or other legal issues the time provided by the time server is legally accepted as being accurate.

The TS-3000i clocks can directly communicate to the NIST or internal/external NTP servers and automatically perform time synchronization. All clocks are configured through a web browser using a web-based interface. Within the web interface, the end-user has access to 18 pre-defined Stratum 1 NTP servers. A Stratum 0 device is an actual atomic clock. Therefore, a device that receives a time signal from a network time server is a Stratum 2 device, and as the Stratum number increases the less accurate the time signal is.

TS-3000i Clock Discovery and Access:

The TS-3000i provides multiple ways to access the clock settings; either through the web interface or the TS-3000i Utility CD. *An innovative feature of the clock is Zeroconf which provides an easy method of finding peripheral devices without knowing their IP address.*
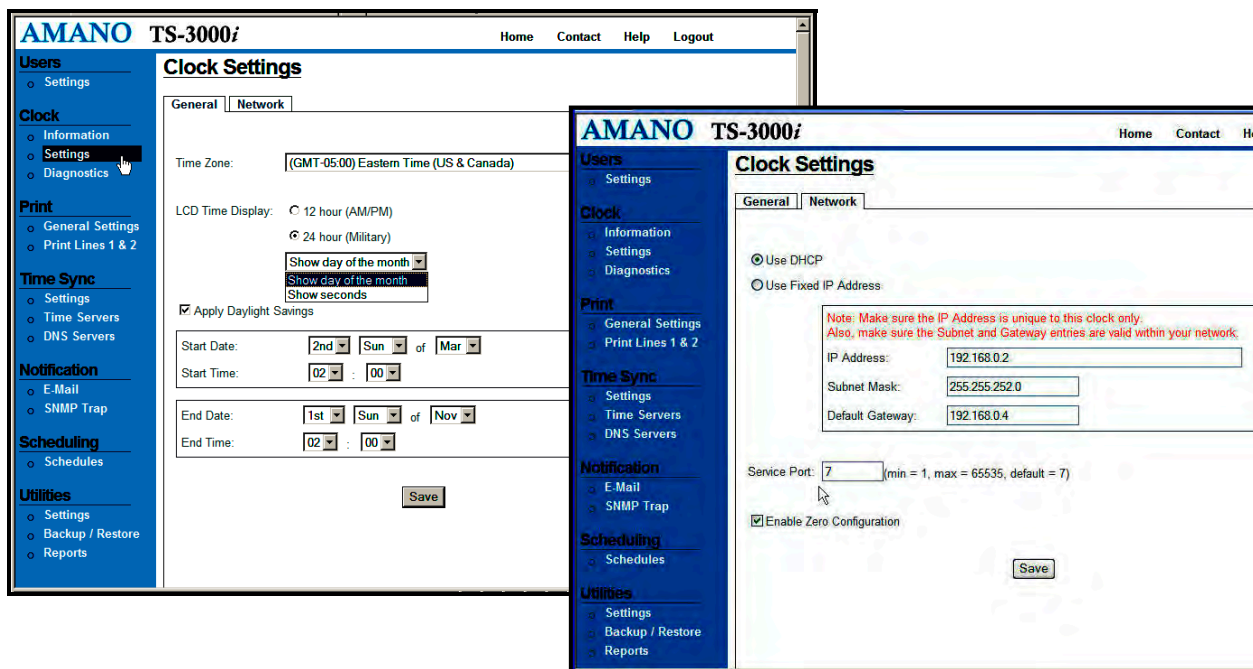

Figure: TS-3000i Web Interface for General & Network Clock Settings

Zeroconf or **Zero Configuration Networking:** is a set of techniques that automatically creates a usable IP network address without configuration or special servers. This allows inexpert users to connect computers, networked printers, and other items together and expect them to work automatically. Without Zeroconf or something similar, a knowledgeable user must either set up special services, like DHCP and DNS, or set up each computer's network settings by hand, which is a tedious task, and is challenging for non-technical people. Zeroconf utilizes the open Bonjour protocol: www.apple.com/bonjour. Router Note: Port 5353 must be open for local service discovery. Port 53 must be open for a wide area service discovery. Select Service Port (default = 7) for the TS-3000i's built-in TCP service that allows a user to initiate an operation from an external application (i.e., the TS-3000i utility functions). Any unreserved port of 1 thru 65535 can be used.

DHCP (Dynamic Host Configuration Protocol) compatibility for IP address management and other parameters (subnet mask, gateway) from the DHCP server, to ensure all IP addresses are unique.

A Zeroconf protocol is able to operate in the absence of configured information from either a user or infrastructure services such as conventional DHCP or DNS servers. Zeroconf protocols may use configured information, when it is available, but do not rely on it. For example, the use of MAC (Media Access Control) addresses (i.e. layer two addresses) as parameters in Zeroconf protocols is generally acceptable because they are globally unique and readily available on most devices of interest. The benefit of Zeroconf protocols over existing configured protocols for the end user is an increase in the ease-of-use and a simplification of the infrastructure necessary to operate protocols.

"The TS-3000i installation is as simple as plugging in a cable"

You put your laptop on the desk, connect an Ethernet cable and you are on the network. In an office environment, that is achieved by utilizing a centralized infrastructure. The company will have a DHCP server to allocate you an IP address, and DNS servers so you can talk to the services you need using names rather than numbers. How about a way to just plug in a clock and it starts to sync automatically? Or have the ability to move the clock anywhere in a building without affecting performance. Ease of installation and maintenance where the networks you want to form are often ad hoc with no centralized infrastructure.

Using Zero Configuration Networking ensures a device assigns itself an address and human readable name, avoiding clashes by negotiating with its peers. Zeroconf also enables a device to advertise the services it offers to the network, and to browse for services that other devices are advertising.

Finding a TS-3000i does not involve asking someone where it is, what its name is and what model it is. The actual TS-3000i advertises those details, which makes installation, maintenance, and configuration simple. Literally, there is zero configuration involved. The end user is insulated from the complexity of the network.

TS-3000i Web Interface Features

Category	Sub Category	Summary of Function
Supported Environment	Client PC	-Web Browser
Clock configuration	Login	-User login configuration (Maximum 2 users)
	Printing options	-General print setup -Print Line 1 & Line 2 setup
	Alert configuration	-Email: accounts (Maximum 2 accounts) -SMTP server configuration
	Trap	-SNMP configuration -Send failed synchronization message with Time Server or ATVS clock to any SNMP Trap Agent
Time synchronization		-Acquire time from NIST servers and latency calculation -OATS compliance with time accuracy between [-3, 3] seconds per day
Zero configuration Networking		-Device discovery -Automatic IP address assignment
Maintenance/Diagnostic		-Reset to factory defaults -Reset numbering count -Display actual clock configuration -LCD start/stop test -Request Clock Date/Time -Request Firmware version -Test connection for Time Server, DNS Server, SMTP, and FTP Server
Report		-Transaction report for today or date range
Backup/Restore	Backup	-Configuration -Transaction
	Restore	-Configuration -Transaction
Scheduler		-Schedule backup (Configuration or Transaction or Both) -Schedule report -Schedule time synchronization (Maximum 12 per day)

TS-3000i Configuration Functions

The TS-3000i TimeSync web clock provides the following user configurable parameters:

1. Clock time zone

2. Hour format for display and transaction reports from the clock {12 hours (AM/PM) or 24 hours (Military)}

3. DLS (Daylight Savings) settings if applicable

   a. DLS start date end time

   b. DLS end data and time

   Note: The time zone selected controls the time zone adjustment sent to the clock. If FINRA OATS Rule 7430 compliance is required, the time zone must be set to (GMT-05:00) Eastern Time (US & Canada).

   The DLS option should only be un-checked in areas where DLS does not apply and no regulatory requirements exist.

Printing Options

General Print Options

1. Configure Print direction, options {LEFT justify or RIGHT justify}, and default RIGHT justify.
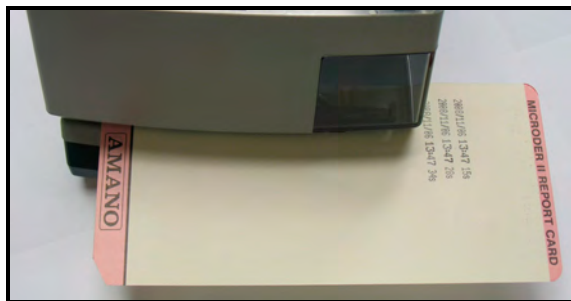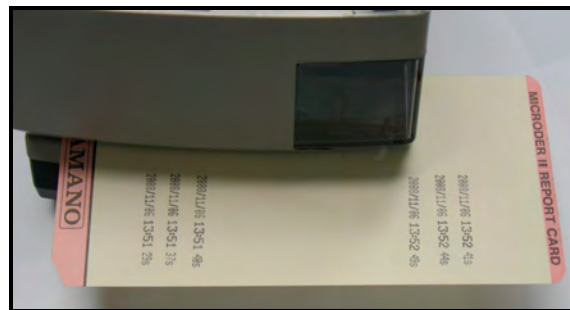

Figure: Left Side Print Example   *Figure: Right Side Printing Example*

2. Configure Leading Zero, option ON/OFF, with default = ON.

   Sample: if the date is 07/08/2008, leading zero ON will show 07/08/2008 and OFF will show 7/8/2008

3. Configure Minute format, options {10^{th} or 20th or 60th or 100th}, with default = 60th

   Sample: If time on clock is 16:30, 10th: 16.05, 20th:16.10, 60th:16.30, 100th: 16.50

4. Configure Dual print, option ON/OFF, with default = OFF.

Sample: if I have line 1 and line 2 defined and dual print is ON using print button on clock will print line 2 or based on print it will alternate print line 1 and print line 2. If dual print is OFF using print button on clock will not print anything, it will only print line 1.

5. Configure Auto numbering

   a. Set initial print value, default 1, must check option to reset initial value, numeric field

   b. Configure initial Step interval type

      I. Print same number for every print

      II. Print number N time(s) and increment by 1, define N (maximum 999998), numeric field

Print Lines 1 & 2 Option

1. Configure Print line(s), option define line 1 and/or line 2 strings to print.
2. Print line 1 default to NASDAQ settings and Print line 2 default = clock IP/MAC address.
3. Add Text (maximum 21 characters) will move text from edit text to list box (maximum 10 rows).
4. Add Symbol will move symbol from edit text to list box maximum 10 rows).
5. Message will display sample of text based on option date time.
6. Text/Character, Symbol can be print as Bold or Regular.

   Sample: <Message>: 2008/07/08 18:30 15s with seconds in bold will show
   2008/07/08 18:30 15s

The selectable print options offer a variety of industries ways to document time, date, text, on documents that relate to research, audits, dispatching, and job costing. Examples of such industries are: manufacturing, hotel/motel, healthcare, mailroom, restaurants, and government.

Clock Time Synchronization

The clock offers dynamic sync scheduling for improved accuracy with up to 12 syncs per day. This will allow transaction log data to be maintained automatically in the clock for 5 years with a normal sync schedule of 2 synchs/day and can be e-mailed, saved or printed as desired. During set-up, the user has the ability to sync from a list of 32 NTP servers, which enhances the ability for a successful sync. The system will provide 18 default Stratum 1 NTP servers for user to select from. An additional 14 NTP servers can be added.
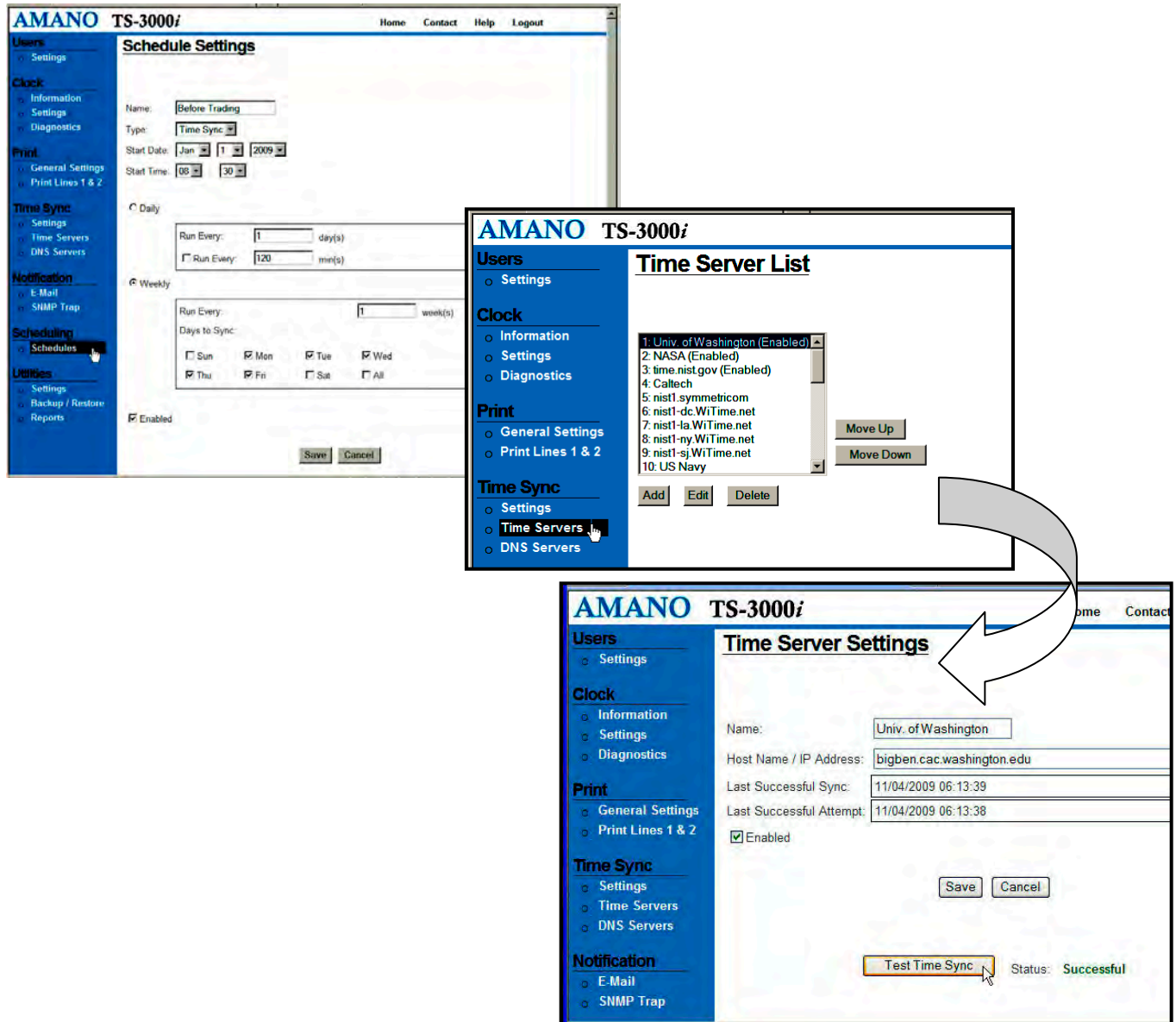

Figure: TS-3000i Web Interface for Schedule & Time Server Settings

TS-3000i Reporting Capabilities

The TS-3000i web clock has a built in memory storage to store time synchronization transactions. The transaction report can be displayed and/or saved to a TXT file via an FTP server. Reporting is web based directly from the clock and is for a single clock IP address. At a pre-determined time of the day and day of the week, the TS-3000i web clock can be set to send a transaction report and/or send an archived back-up file to a designated FTP site (path).

Note: Centralized reporting is available by using the Reports function in the TS-3000i Utility CD that comes with the clock to create reports in either html or text formats. See the following figure for an example of a transaction report created from TS-3000i transaction data with the TS-3000i Utility CD.
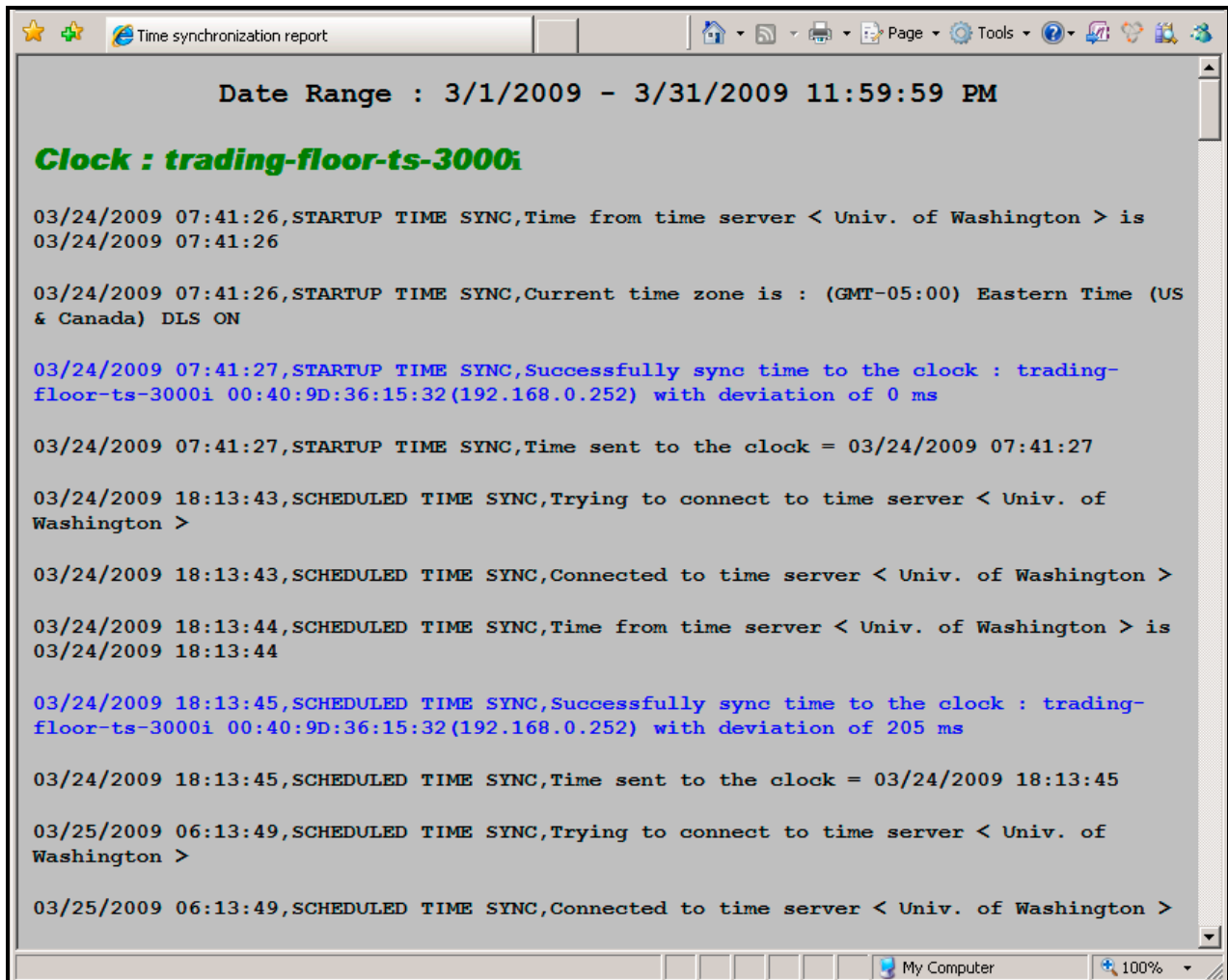

Figure: Example of Centralized Transaction Report Created with TS-3000i Utility

TS-3000i Notification Capabilities

Via SNMP Trap settings can be configured. See the following actual Web screen for the clock E-mail & SNMP Trap settings configuration views:
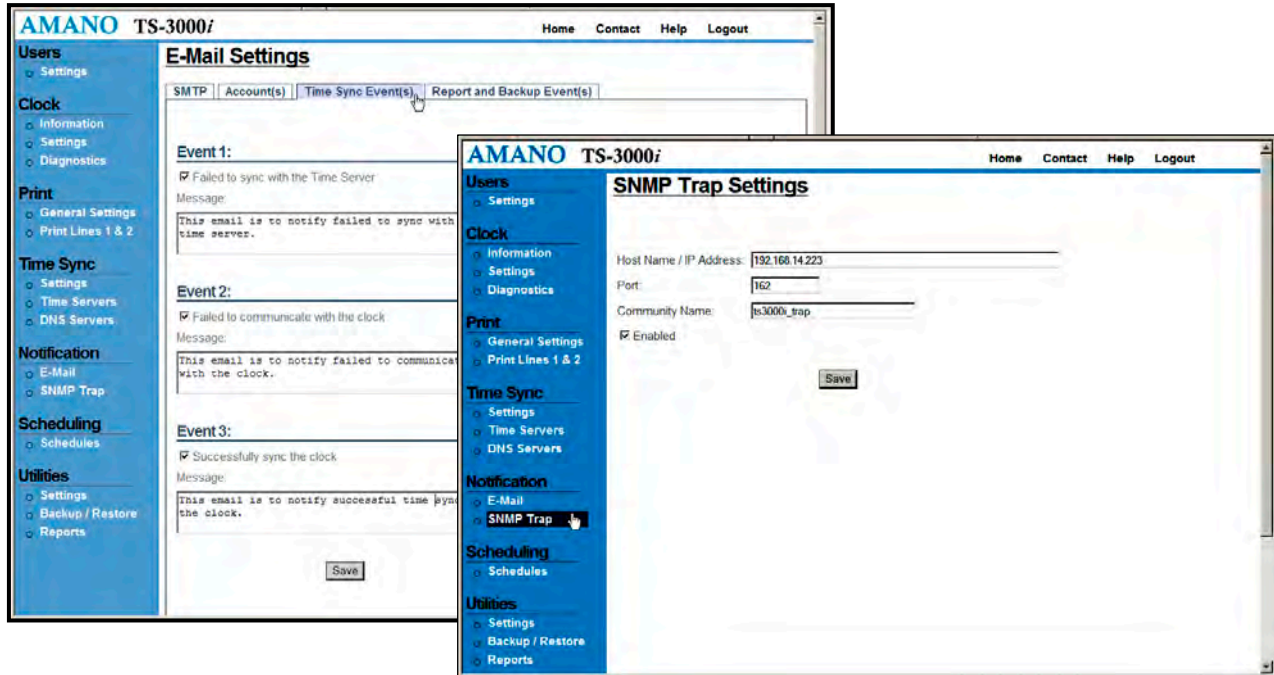

Figure: TS-3000i Web Interface for E-Mail & SNMP Trap Settings

E-mail and SNMP trap notification provides the network administrator an ability to centrally manage the clocks from one location. SNMP traps allow you to monitor your TS-3000i's constantly, even when you're not there. It also enables you to keep logs that prove your clocks are running reliably and show when you took action to avert an impending issue. This saves you time and provides efficiency in clock management. Amano has an Enterprise ID to keep messages from the TS-3000i separate from other network system traps/alerts.

Router Notes: Port 25 must be open to use e-mail notification, and Port 162 must be open to use SNMP traps.

TS-3000i Built-in Utilities

The TS-3000i web clock utilizes an FTP server to back-up/restore the clock configuration and transaction files. FTP configuration must have FTP configured in order to run reports. All files will reside on your internal FTP server.

Figure: TS-3000i Web Interface for Utility Settings

Backup: Built in system to save data in case of failure or complete memory lost.

The end-user has the following options to save data in their back-up systems:

- Option to dump all or by date range sync operation records to FTP site via web based interface.

- Option to save all or by date range sync operation records to local machine via web based interface. End-user can now create a file residing in the PC.

The client will have the ability to establish an FTP session via the clock to download the file directly without going through the web browser to initiate the download.

Router Note: Port 21 must be open for FTP.

Restore: Built in system to restore data in case of failure or complete memory lost.

Note: All clock programming is done through the web interface. All configuration of the clock will be available on the web interface. Therefore, the clock has no programming buttons to eliminate any type of time clock manipulation and ensure total security. **The end user will also have the ability to "replicate" the configuration settings of one clock to multiple clocks**. This will save you valuable time when setting the same configuration settings on multiple clocks.
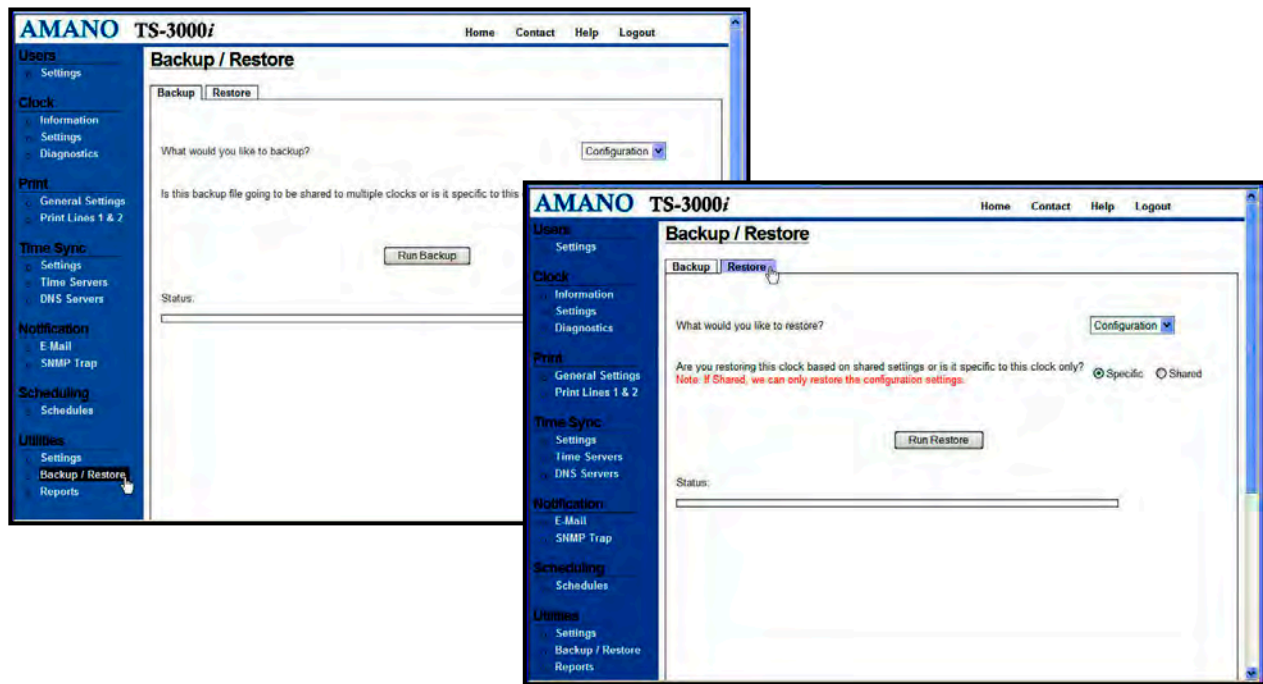
Figure: TS-3000i Web Interface for Backup & Restore Utility

TS-3000i Hardware Specification

Power requirements:	120 VAC ± 10%, 60Hz (Note: with PoE option, AC power is not required) 100 and 230 VAC ± 10%, 50/60Hz
Power Consumption:	Normal 4.5W, maximum 25W
Power Fail Memory Protection:	Built-in lithium coin battery (up to 12 months)
Communication:	10/100 BaseT (auto-sensing), RJ-45 Network connection.
Ambient conditions:	Temperature -10°C to 45°C (14°F to 113°F) Note: FPR option, the temperature 0°C to 45°C (32°F to 113°F) Humidity: 10% to 90% (non-condensing)
Dimensions:	Width 150 mm x Height 176 mm x Depth 153 mm (Width 5.9 in x Height 6.9 in x Depth 6.0 in)
Weight:	2.3 Kg (5 lb.)
Environment:	Indoor use only; Dust free Not in direct sunlight
Standards Compliance:	UL, CE
Clock configuration:	Access through built-in web interface.

Print Format configuration: Print format selection through built-in web interface.

Factory set print style: Print format that will print *year/month/date hour:minute:seconds*, with the year printed as a four digit number. (Can be changed by Web interface)

Dual Auto-Print feature: This feature allows the automatic printing of a second programmed print style, without having to push the auxiliary Symbol Print Bar.

Options:

Full Power Reserve: Optional, 9.6V, 700mAh NiCad rechargeable battery. Fully charged it will maintain normal operations for 6 hours or 400 prints

PoE: Power Over Ethernet, requires 9.6V, 700mAh NiCad rechargeable battery

Full Power Reserve

The Full Power Reserve option is designed to provide up to 6 hours, or 400 prints, or maintain seven days time and date during power failure. A NiCad battery (Amano part number: AJR-111000) will be provided if the option is selected.
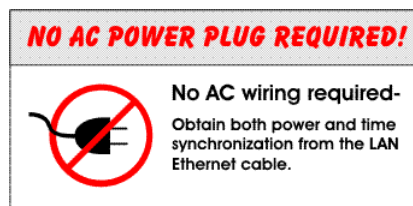
Power over Ethernet (PoE)

PoE is technology that extends the already ultra-broad functionality of Ethernet by supplying reliable DC power over the same cables (Cat5/Cat5e/Cat6) that currently carry Ethernet data. This technology eliminates the need for running both data and power wires to each network device. The device with PoE feature can be installed and re-located where performance is optimum, without concern of an existing AC outlet. The TS-3000**i** can be located anywhere in the standard distance Ethernet network supports.

Because of power limitation, the clock utilized PoE feature has to be equipped with full power reserve option.

The benefits of PoE include increased mobility for TS-3000**i**, added safety (no AC power involved), simplicity of installation, reliability, security and costs savings.

With the PoE Option for TS-3000**i**:

NO AC POWER PLUG REQUIRED!

No AC wiring required-
Obtain both power and time synchronization from the LAN Ethernet cable.

PoE begins with an Ethernet power source such as a PoE compatible switch or a mid-span power "injector". These devices insert power onto the Ethernet cable. The power source is typically installed in the "wiring closet" near the Ethernet switch or hub.

The TS-3000i clocks may be ordered as PoE compatible, or converted at a later time by adding the PoE option kit. PoE is able to supply a maximum of about 15 watts of power over the Ethernet cable.

Why Zeroconf for the TS-3000i?

 "Zeroconf is short for zero configuration IP networking, a method of network devices via an Ethernet cable without requiring configuration and administration. Zeroconf is able to allocate addresses without a DHCP server, translate between domain names and IP addresses without a DNS server, and find services, such as a printer, without a directory service."[3]

Hosts in a network can be assigned static or dynamic network configurations. Static hosts are usually assigned when hosts are permanently connected to administered networks, while dynamic hosts are often used in large networks, such as corporate local-area networks, when computers are frequently reconfigured, or when a limited number of IP addresses are available to share between many computers.

This technology is intended for use in networking situations where it is necessary or impossible to establish a working IP network using traditional technologies, such as DHCP and DNS. Zeroconf can also prove its usability in situations where it is necessary to rapidly configure devices (i.e. TS-3000i) in network infrastructures where the intent of the purchase is "cost of doing business". This is especially true for businesses where "validated time" is core to their operations.

[3] Source definition: http://www.webopedia.com/TERM/Z/Zeroconf.html

Synchronized Time for Your Industry

"What is the risk to my company if I do not have synchronized time?" If it is determined that you can be held legally liable and accountable for negligence, how accurate do my clocks have to be? (from milliseconds to a few seconds). How do I determine and then access an accurate network time source?

Once these questions have been addressed, then you need to prove to auditors and regulators that the time on the clock was correctly synchronized with a validated time source. This requires an ability to generate reports. Security on the clocks must also be established to ensure time-based data manipulation does not occur.

Synchronized time is an important business and technology requirement and can be an inexpensive way to prevent your company from receiving negative press and facing legal issues.

TS-3000i Utility CD (Included)

The included TS-3000i Utility CD, once installed, will allow the user to automatically and/or manually discover clocks to easily setup configuration and update the clock firmware. Upon startup the utility will automatically start search for clocks which are located on the same subnet as the PC where the Utility is open. The utility will allow the user to:

- ✓ Browse all clocks locally and in multiple domains.
- ✓ Update clock information with latest configuration and firmware.
- ✓ Get clock configuration to PC.
- ✓ Get clock transaction to PC.
- ✓ Monitor clocks state on the network (on-line/off-line); also get email for offline clocks.
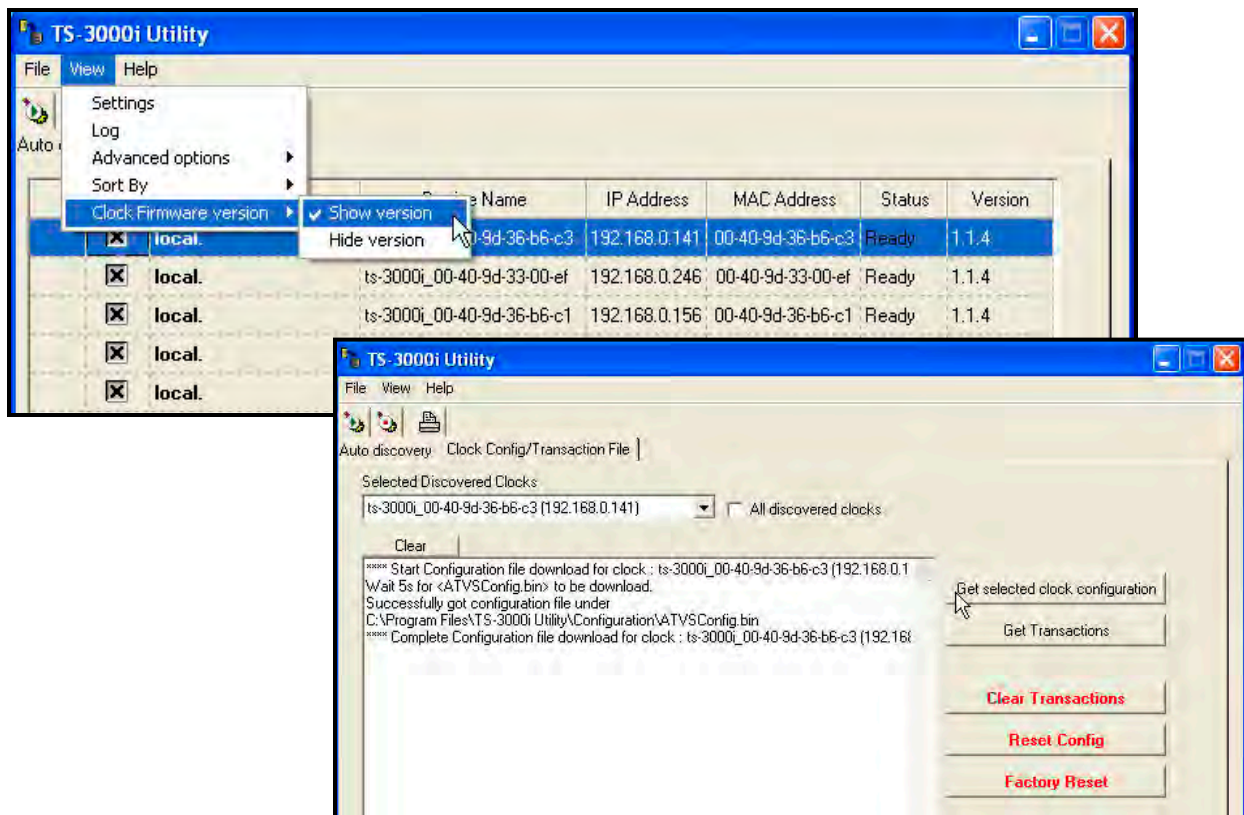- ✓ Print list of discovered clocks on default printer.

Figure: TS-3000i Utility CD

Amano Cincinnati, Inc.

For more than 40 years, Amano Cincinnati, Inc. has specialized in time management products to help its customers accurately, simply and cost-effectively track time. Our customers use our products to automate day-to-day time and attendance tasks, meet regulatory requirements, reduce paperwork, facilitate growth and realize greater efficiency. As a subsidiary of Amano Corporation Japan, Amano benefits from the influence and support of a global business generating in excess of $700 million in annual revenues and 2,900 employees worldwide.

For more information on our time based solutions for your business, go to **www.amano.com/time** .

Figure: TS-3000i TimeSync Web Clock at Amano

NOTE: