TBOX

The fully integrated, IP66 weatherproof housing is available in aluminum or stainless steel. This ready-to-install solution includes single or redundant lithium batteries, PSTN or wireless communication device, I/O for end device interfacing, and optional liquid crystal display.

Intelligent Solutions for Remote Monitoring and Automation
Semaphore T-BOX WM Wireless Monitor

Only the affordable, ultra-low power, ultra-capable T-BOX Wireless Monitor allows you to stay connected and in control of all your remote assets.

T-BOX WM extends advanced monitoring, automation and telemetry capabilities to processes requiring as few as one or two measurements. Numerous, integral features provide the functionality users need at such locations:

Push Messaging via e-mail, FTP, and SMS text and "pull" messaging using SCADA protocols such as Modbus efficiently ensure complete access to site information for all users.

Integral Web Server allows T-BOX WM to manage Internet and intranet communications without a front end device and provides a very inexpensive HMI for operations and maintenance.

Alarm Management and Data Logging report all live conditions and historical data base information to multiple recipients.

Process Automation and Calculations — IEC 61131-3 Ladder Diagram, Basic and Microsoft Automation environments expedite configuration of automation tasks and custom calculations for virtually any remote asset or process.

Multi-communications via a choice of CDMA cellular, GSM cellular, PSTN modem and spread spectrum radio mean that all remote sites are accessible.

Ultra Low Power Management minimizes power system costs and maintenance by providing long battery life up to ten years on a lithium C-size battery. A redundant battery option significantly increases reliability.

Integrated Packaging minimizes additional purchasing and project costs. Complete monitoring, telemetry and automation functionality, with a power source and communication device, are included in a single package.

Vertical Markets and Applications

The highly capable T-BOX WM Wireless Monitor is applicable to a broad range of vertical market installations:

Mobile asset management
• Management of pumps, generators, and other mobile equipment

Infrastructure management
• Chemical tank monitoring
• Solar/Battery/UPS monitoring
• Water system monitoring and control

Water/wastewater
• Level monitoring for storm water, basins, canals, rivers
• Combined sewage overflow (CSO) monitoring
• Pump station, lift station level monitoring

Agriculture/irrigation
• Irrigation monitoring and control

Oil & gas
• Pressure point monitoring
• Water flood monitoring at regulators

Broadcast and telecom/transportation
• Facility monitoring

The DIN rail-mounting package presents a very compact footprint for installation in equipment enclosures. All communications and battery features are available with this package.

Model Number Selections

T-BOX WM uses an intelligent catalog numbering system:

WM-<u>xxx</u>-<u>a</u> <u>b</u> <u>c</u> <u>d</u>

Where:

xxx identifies the electronics version

a = communications option

b = housing

c = LCD

d = standards/certifications

Selections:

Electronics — I/O selection

- WM-100 = 4 DI and 4 DO — LCD not allowed
- WM-200 = 4 DI, 4 DO plus 2 AI with 4-20 mA drivers and RS 485 for LCD

Communications type

- G = GSM
- S = Serial port, RS 232
- R = Spread spectrum radio, 2.4 GHz/outside North America (compatible with G3 radio)
- K = Spread spectrum radio, 900 MHz/North America
- P = PSTN
- C = CDMA

Housing selection

- D = DIN rail-mounting enclosure
- M = IP66 aluminum enclosure
- S = IP66 stainless steel enclosure

LCD

- 0 = Without LCD
- L = With LCD — WM-200 only; aluminum or stainless steel housing only (not DIN rail)

Standards/hazardous area certifications

- 0 = Standard approvals
- 1 = Class I Division 1/Atex Zone 1

Accessory Items:

- Second battery, related parts
- Antennas, cables, related products
- Integral sensors for level and pressure

Operations Overview

Input/output operations

Wireless Monitor model WM-100, the most basic version, applies to assets and processes requiring inputs from discrete devices such as alarms, contacts, door switches, float switches, and valve limit switches.

Discrete outputs can be used to drive indicators as well as to control operations in an on/off, raise/lower or similar fashion.

Model WM-200 adds two analog inputs to the I/O count. The AI points are readily interfaced to sensors and transmitters for measurement of flow, level, pressure, temperature, and other conditions.

The analog inputs provide current to operate low power sensors as well as 4–20 mA transmitters. While the latter appear to be incompatible with an ultra low power device that runs on a lithium battery, T-BOX WM employs intelligent power management to make their use feasible.

Such transmitters are normally operated on a duty cycle schedule such as once per hour. T-BOX WM allows the operator to select the operating frequency, ranging from once per second to once per day, and the "on" time, ranging from one to 60 seconds. The "on" time ensures that the transmitter reaches a stable output before a reading is recorded.

Operating transmitters on a duty cycle saves considerable battery power and significantly extends battery life. Semaphore's "Battery Life" spreadsheet allows users to determine how battery life will be affected by operations such as analog inputs and communications.

Local display/pushbutton operations
A T-BOX WM-200 model using a weatherproof, IP66 enclosure can be equipped with an optional, liquid crystal display (LCD) for taking readings and two-button keypad for local operations.

Normally, the LCD is powered-down to extend battery life. A local user can wake-up the display by pressing the left pushbutton. The LCD will then remain on for a user-configurable time between one minute and one hour. Typically, the LCD operates for five minutes to allow the user to view the live status of inputs, e.g. to see a tank filling.

The inputs and variables to be displayed are user-configurable. Two lines allow two readings (e.g. both analog inputs) to be viewed, simultaneously.

Local maintenance operations
While the LCD provides readings of alarms, process information and diagnostic status of T-BOX WM sub-systems, a PC can also be used. The local, RS 232 port is readily accessed by removing captive fasteners for the front panel. Since the front panel is mechanically secured, technicians need not be concerned about dropping it.

Using the integral web server, PC users can access all live and historical information via dynamic "mimic" displays, tabular displays and trend displays. Configurable parameters for operations and communications settings are easy to access and modify using TWinSoft menus. In addition, TWinSoft can be used to edit calculations and programmable logic as well as perform operations including application program downloading.

Communications operations
Operation of the wireless communications devices and PSTN modem best utilize the appropriate communications networks while conserving power to extend battery life. T-BOX WM keeps these devices in their power down or sleep modes as long as possible and allows user-configurable reporting times. Using Push technology, T-BOX WM also wakes up to report alarms and pre-programmed conditions to multiple recipients in a timely manner. The "Battery Life" spreadsheet allows users to determine battery life for all communications operations.

The 2-line LCD provides a local read-out of live conditions and uses a sleep mode to conserve power.

The quick-disconnect, front panel provides easy access for battery replacement and other maintenance tasks. Redundant batteries allow the Wireless Monitor to operate on one while the other is being replaced.

T-BOX WM enables the complete integration of monitoring, automation and telemetry functionality in a single, rugged package. Compatibility with a broad array of discrete devices and intelligent end devices, combined with advanced, telemetry and web capabilities, provides a solution for virtually any application.

NETWORK MESSAGING AND NOTIFICATION

END DEVICE INTERFACING

Web pages served via the Internet or an Intranet

Flow meters and sensors

T-BOX Wireless Monitor

E-mail Messaging

Low power sensors for level, pressure, etc.

SMS Text Messaging

Analog, 4-20 mA transmitters

SCADA Protocol "Pull" messaging, e.g. Modbus

Access control, contact inputs, security devices

Core Capabilities

Advanced communications

The T-BOX WM Wireless Monitor employs unprecedented, IP/Web technology to extend cost-effective, wireless monitoring and control to virtually any remote location.

Using an integral webserver, T-BOX WM keeps users updated on process and site conditions via the Internet or an Intranet. Locally maintained web pages can be used in place of expensive, HMI/SCADA software licenses and additionally lend themselves very well to local maintenance operations.

Using push technology, T-BOX WM can also initiate messages to multiple recipients, worldwide, via e-mail, FTP and SMS text. E-mail and FTP messages can include multiple files. T-BOX WM provides a versatile method of relaying alarm conditions, status changes, measured data, and remote-control commands over cellular or private radio networks instead of hard-wired connections.

Unlike many monitoring products, T-BOX is not limited to one or two choices of communications hardware. In order to work in practically all remote locations, it can be equipped with a variety of communications options, which include the following:

- GSM cellular
- CDMA cellular
- Spread spectrum radio
- PSTN modem

Web pages can be dynamic, "mimic" displays, which incorporate multiple process objects (shown below), trend displays or tabular displays.
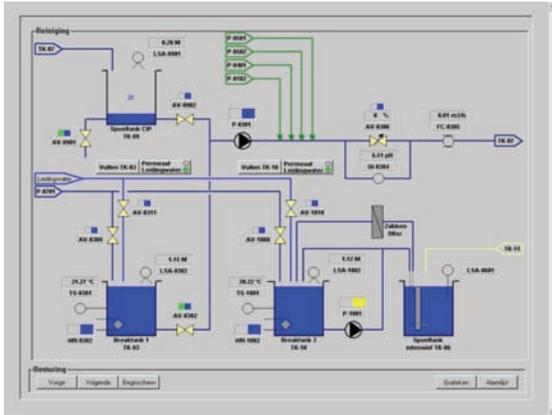
Integral Web Server

As a standard feature, T-BOX WM manages Internet and Intranet communications without the need for a front-end device. Semaphore's software tools greatly simplify configuration of web pages and communications messaging. No complex programming is required. Dynamic objects, entry fields, tables, trends, and links to other pages are simply added with a few clicks.

In decentralized SCADA systems, users have deployed web pages in place of expensive, SCADA/HMI software licenses. For local operations, on-site, technicians have found web pages to be ideal for maintenance tasks.

Very few automation software tools provide the ability to create a Web page to display a process graphic, alarm list, or historical trend. Users are left to configure pages using third-party software, which substantially increase the programming effort and integration project time.

That is why we have created our own solution, WebForm Studio. It enables the creation of embedded dynamic Web pages. In addition, its tools allow dynamic field objects to be added with a few clicks (digital or analog inputs/outputs in the form of a button, bar graph, or indicator), alarm tables, tables of historic trends, and entry fields. The layout links to other pages and selective displays according to the level of authorization. Functionality is simplified to be within everybody's reach.

WebForm Studio software uses Microsoft's ActiveX technology. It has tremendous potential with regard to displays and user-friendliness. The code produced is very compact, thus reducing the transfer time, an important aspect for modem and GSM communications.

Push Communications

Network Communication

Web pages served via the internet or intranets

E-mail messaging

SMS text messaging

PDA users can remotely monitor and send control commands.

T-BOX WM

Process inputs/outputs
Fixed and mobile assets e.g filters, generators, motors, pumps, valves

E-mail

On a programmed schedule or change of state, a T-BOX RTU can send e-mail messages to multiple recipients. E-mail messages can have attached files, which include complete reports with live and historical information as well as alarms and events.

Text messaging

Like E-mail, SMS text messages can be transmitted to multiple recipients on a programmed schedule or change of state. This allows mobile phone and PDA users, anywhere in the world, to be fully informed of conditions at the site.

Alarm management

Using push communications, a T-BOX RTU sends alarms to a variety of recipients, including e-mail boxes, mobile phones, pagers, web portals, etc. Integrated alarm management includes control of repeated call attempts, escalation/redirection, acknowledgement management and multiple levels of authority. Alarms can be acknowledged even via a mobile phone.

SCADA compatibility

While T-BOX WM features IP, push and web technologies, it also drops in to traditional SCADA systems, which use a variety of common or standard protocols, such as Modbus.

Data logging

All T-BOX products support sophisticated archiving, with elaborate preprocessing locally at the RTU. Values can be maintained in the form of averages, maxima, minima or instantaneous samples. Event tables include alarms and events for the controller as well as the asset/process.

Programmable Automation and Calculation Capabilities
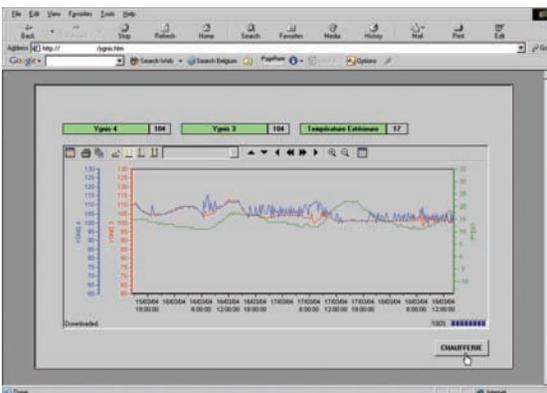
IEC 61131-3 Ladder Diagram, Basic and Microsoft Automation environments expedite configuration of automation tasks and custom calculations for virtually any remote asset or process.

TWinSoft consists of programming tools, a real-time execution engine, and personalized development tools for equipment manufacturers and integrators (through Microsoft Automation). In TWinSoft, the design of control programs is facilitated by the use of a user-friendly and interactive ladder diagram editor that complies with the IEC 61131-3 standard.

The editor is immediately familiar to the LD programmer and intuitive for the novice programmer. A combination of the mouse and keyboard commands is all that is needed to complete development.

TWinSoft contains a complete set of tools, including an editor, debugger, code generator, documentation generator, library manager, archiver, and online control. It is very easy to add lines or comments, duplicate entire parts of the program, or create new variables, modules, and macros.

Using TWinSoft, users minimize design time by directly using libraries of predefined functions and subprograms, which include control, mathematical functions and conversions, and Boolean functions. Dynamic analytical tools allow programmers to rapidly perfect their applications and include online ladder display, states of timers, meters and internal registers, locally or remotely in complete security. For programmers who are more at ease with high-level languages, programming in BASIC is also available.

Whether the application requires a few lines of programming or several thousand, automation specialists will quickly learn TWinSoft. Specific attention has been paid to the quality of online help, which is available in English, French and German.

The TWinSoft software tool, user-friendly and intuitive, maximizes the benefits of the various functions of T-BOX solutions. Users can create and save different configurations for T-BOX systems and then download them locally or remotely.
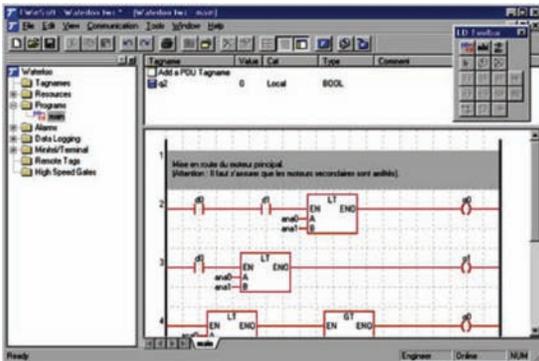
T-BOX processing capabilities are appropriate to automation requirements as well as custom calculations and logic. The LD programmer will find the IEC 61131-3 ladder diagram editor to be familiar and intuitive. For those who prefer structured text, a BASIC environment is also provided. Systems suppliers who use Microsoft tools are also supported through Microsoft Automation.

TWinSoft allows users to do the following:
- Define stations (I/O, communications, etc.), alarms (type, messages, and calendar), the information and select its criteria for filing your interface screens for the operator terminals (Minitel, T-BOX Terminal)
- Create, modify, and quickly debug the automation program presented in the form of an IEC 61131-3 diagram
- Analyze, locally or remotely, the station status:
    - List the alarms that have appeared and their status
    - List the contents of the archives
    - Diagnose the status of the automation system
- Update (directly and without hardware manipulation) the software versions of the various stations

T-BOX WM SPECIFICATIONS

Model	WM-100	WM-200
Inputs/outputs		
DI — dry contact inputs, 0-12 Vdc	4	4
DO — open drain	4	4
AI — 0-5 Vdc and 0/4-20 mA		2
Source low power voltage transmitters		Yes
Source 4-20 mA transmitters		Yes
Integral communications		
RS 232 local port	Yes	
RS 232 network port option	Yes	
GSM/GPRS option, dual band EGSM900/GSM1800	Yes	
CDMA option	Yes	
SS radio options, 900 MHz or 2.4 GHz, 9600 baud	Yes	
PSTN option	Yes	
Power		
Internal battery	Lithium C cell	Lithium C cell
Redundant battery option	Yes	Yes
Operating voltage	3.6 Vdc	3.6 Vdc
Battery voltage measurement	Yes	Yes
Average power draw	0.05 mA	0.1 mA
Battery life	5 to 10 years	4 to 8 years

Model	WM-100	WM-200
Processor/memory		
Processor	Low power Mitsubishi 16-bit microprocessor	
Real time clock	Yes	
Flash	768K	
RAM	148K + 245K (sampling tables)	
Environment		
Operating temperature	-40° to 70° C	-40° to 70° C
Liquid crystal display	0° to 50° C	0° to 50° C
Storage temperature	-40° to 80° C	-40° to 80° C
Humidity	5 to 95% RH	5 to 95% RH
Approvals	CE, UL, CSA	CE, UL, CSA
Hazardous areas (pending)	Zone 1, Class I, Div. 1 and 2	Zone 1, Class I, Div. 1 and 2
DIN rail-mounting package		
Size, inches	5.91 H x 3.27 D x 1.14 W	5.91 H x 3.27 D x 1.14 W
Size, mm	150 H x 83 D x 29 W	150 H x 83 D x 29 W
Weight	300 gr/9.65 oz	300 gr/9.65 oz
IP66 weatherproof package		
Size, inches	5.51 H x 7 W x 3 D	5.51 H x 7 W x 3 D
Size, mm	140 H x 177.8 W x 76.2 D	140 H x 177.8 W x 76.2 D
Weight with single battery	600 gr/19.3 oz	600 gr/19.3 oz
LCD and pushbutton option	No	Yes

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