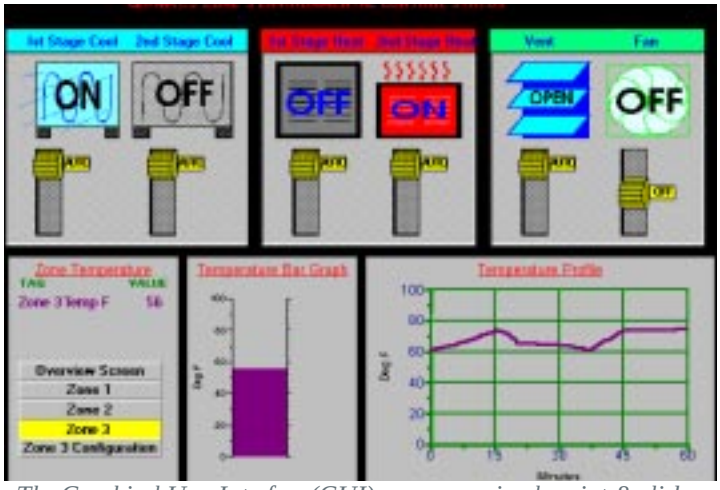
GRO-MACS

COMPUTERIZED ENVIRONMENTAL MONITORING, ACQUISITION & CONTROL SYSTE

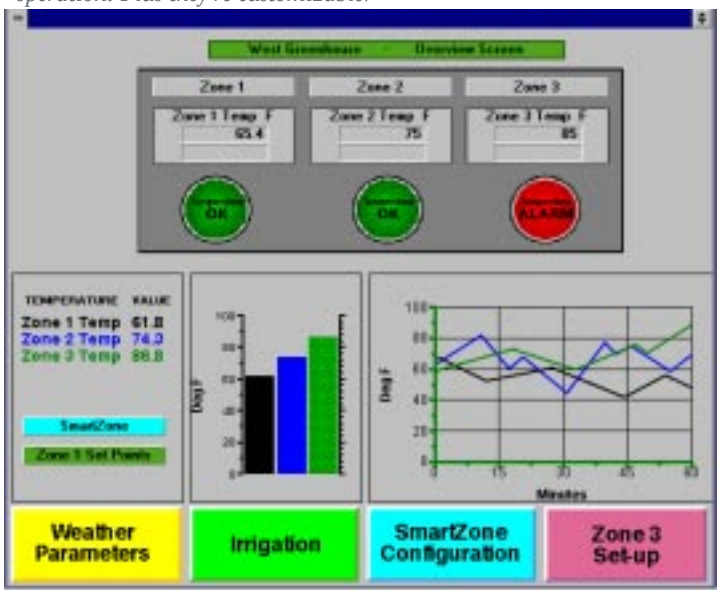
For easy yet powerful, Windows™-based, computerized control of your greenhouse or other growth facility environment. Create the ideal conditions for optimum and uniform growth while you save on water, fertilizer/food, labor, and on energy costs. You'll get a better quality product and higher product yield! Plus, GRO-MACS is so cost effective that systems can pay for themselves in as little as a few months!

GRO-MACS turnkey systems come ready to use right out of the box with no programming required! Or we can design a customized system to meet *your* unique requirements and control strategies. GRO-MACS consists of a network of Control Stations, each with a series of Zone Controllers, which can be connected to each other to form a distributed network connected to your IBM-compatible PC running Windows™. The PC is used to configure and monitor the operation of the system, including control and set-up for all sensors and devices via your easy, graphical software interface. Not just for greenhouses, GRO-MACS is also ideal for:

- **HORTICULTURE/FLORICULTURE.** Greenhouse, nursery, and growth chamber control; hydroponic gardening, mushroom growing, irrigation, …
- **AGRICULTURE.** Poultry and swine houses, hen houses, dairy farms, center-pivot row farming, …
- **INSECTARIES.** Butterfly farms, apiaries, silk production, ladybug and other beneficial insect farms, …
- **AQUACULTURE.** Fish, frog, and shrimp farms, hatcheries, …
- **TURF CONTROL.** Irrigation, misting and fertigation for sports stadiums, golf courses, …
- **RESEARCH FACILITIES.** Universities, agricultural stations, …
- **CLIMATE CONTROL.** Wine cellars, breweries, distilleries, storage facilities, office buildings, meat lockers, …



The Graphical User Interface (GUI) screens use simple point & click operation. Plus they're customizable!



P*RESENTING THE GRO-MACS!* Other greenhouse systems started with control boxes loaded with knobs and interface keypads. Computerization was an afterthought, and centralized control of the systems is often limited. The GRO-MACS, in contrast, was designed specifically for PC control. You get *all* the control and set-up capabilities of *all* sensors, monitors, heating, cooling, irrigation, feeding or fertilization, venting, lighting, etc. *from your PC*. Further, a single PC location in your home or office views, controls, configures, etc. all your greenhouse zones for all your greenhouse locations. GRO-MACS does this with a minimum of wiring—using Zone Controllers for networking in zones, where input and output connections are grouped and connected in hierarchy to a Control Station, which in turn provides connection to your PC. The GRO-MACS package includes:

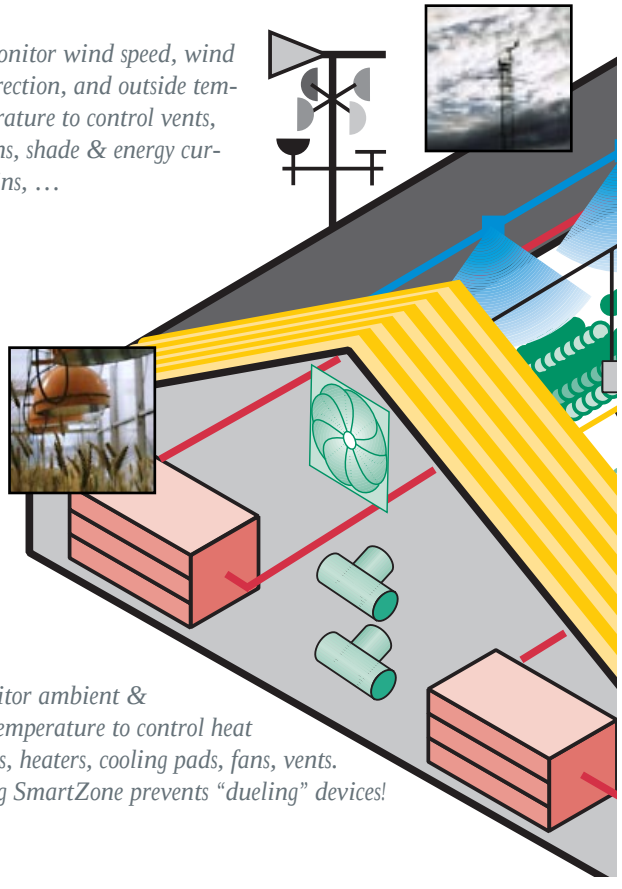
- GRO-MACS MS-Windows software that runs on your PC.
- Up to 31 Control Stations, each with a GRO-MACS control program.
- Up to 31 GRO-MACS Zone Controllers that attach to a single Control Station. Each Zone Controller accommodates up to 10 zones (sensor inputs) with 12 equipment control relay outputs.

A GRO-MACS FOR YOUR GREENHO

- Control and set-up for all sensors and de MS-Windows™ 3.1 or '95!
- Set-up, control and view status on all zor status displays on Zone Controllers can g
- Optional advanced environmental contr fies relationships between individual con
- Turnkey systems, pre-configured to work
- Modular, two-dimensional networking is Controllers as you grow, up to 31 per Co environment sensors, and controls up to
- Historical recording of environmental da
- Simple installation using two-wire RS-48 even sensors and devices, is done with a t

Monitor relative hum ture to control cooling sprayers, other wateri

Monitor wind speed, wind direction, and outside temperature to control vents, fans, shade & energy curtains, …



Monitor ambient & soil temperature to control heat lamps, heaters, cooling pads, fans, vents. Using SmartZone prevents "dueling" devices!

ʜER GROWTH FACILITY IS JUST GOOD SENSE...

ɔne via your easy, graphical software interface. Choose

nhouses, on one centralized location. (Plus, optional LCD
al feedback.)

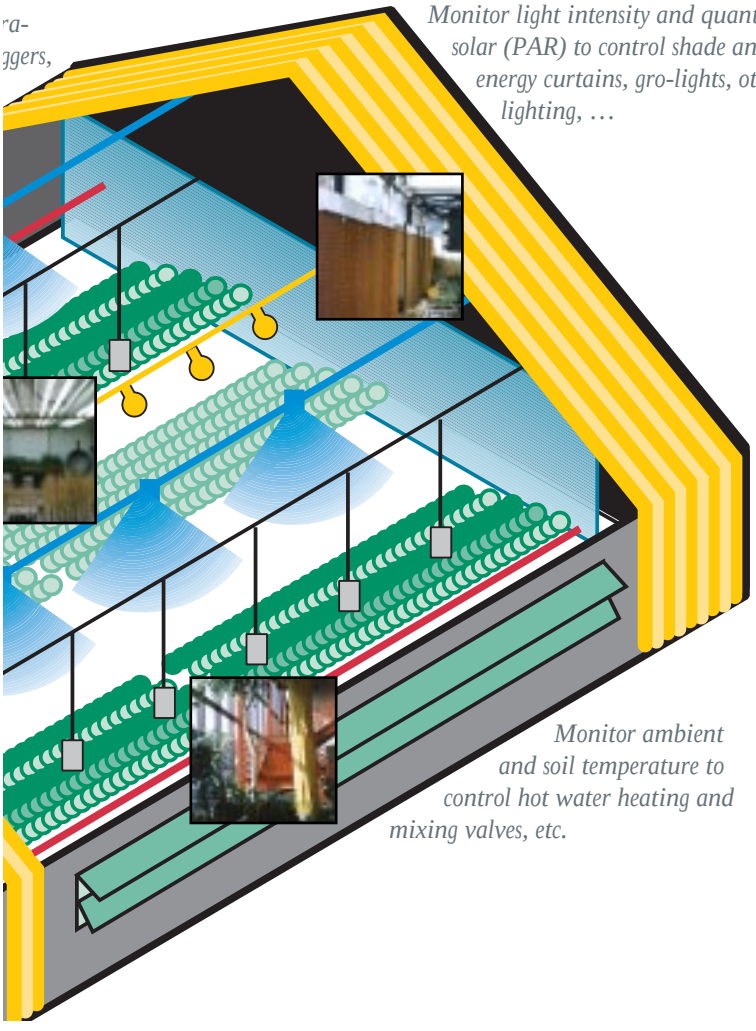
urtZone™—the artificial intelligence program that identi-
xe "smart" decisions for you!

ɔf the box! No programming or configuration!

ɔle and cost effective—you add less-expensive Zone
ɔn. Each Zone Controller accepts input from up to 10
Add up to 31 Control Stations in one "unlimited" system!

ur and graphical formats.

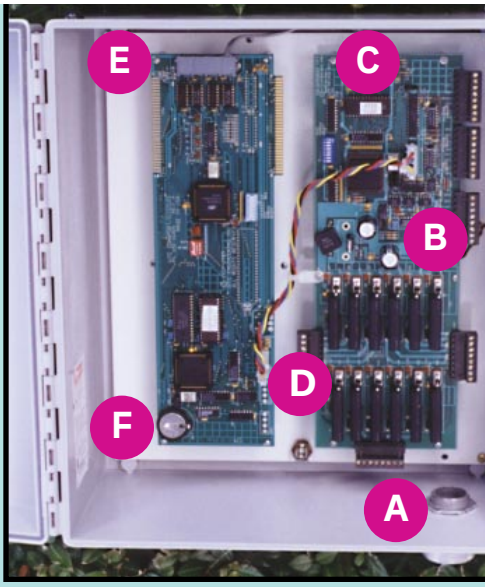
ons; networking of Zone Controllers, Control Stations,
pair—just like that used for modular phone systems.



*ra-
ggers,*

Monitor light intensity and quantum solar (PAR) to control shade and energy curtains, gro-lights, other lighting, …

Monitor ambient and soil temperature to control hot water heating and mixing valves, etc.

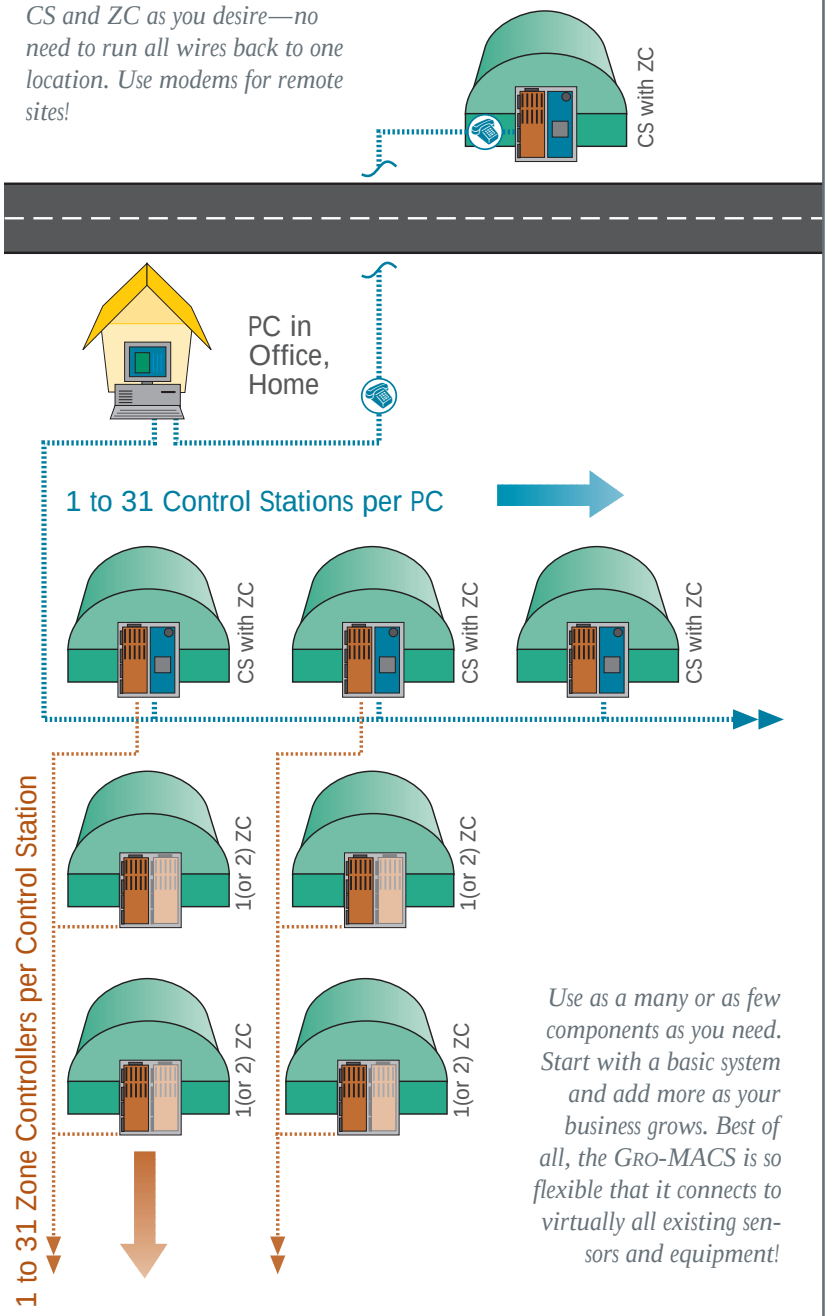


Here is the interior of a typical Gro-MACS Control Station in its water-tight NEMA-4x enclosure. Input/Output (I/O) connections come in and exit through the conduit **(A)**. Using removable wire connector strips **(B)** for easy hookup, the sensors and devices connect to the Zone Controller card **(C)**, which also has a manual override switch with LED light **(D)** for each hookup. The Zone Controller can have up to 10 sensor inputs and 12 device outputs. The environmental control program and parameters are resident on the Control Station Card **(E)**. The internal battery **(F)** preserves the program in the event of power outage. Each Control Station Card can oversee up to 31 Zone Controllers. Up to 31 Control Stations can connect to a single computer.

The ASOMA-WTC Gro-MACS gives you many more benefits—such as:

- System designed for long-term, continuous, unattended operation—independent of the PC for maximum reliability. Your PC can even be turned off! In case of power failure, Gro-MACS has an automatic restart feature that gets the system back up again.
- The enclosure is watertight, standard industrial NEMA-4X fiberglass—ruggedized for challenging environments!
- An alarm system notifies you of emergencies; you can even have your PC dial up remote phone numbers (up to three) to notify you of an alarm condition.
- Customizable screens with animation. Configuration screens allow you to easily configure setpoint tables and set control limits and other parameters.
- Gro-MACS supports unlimited morning, afternoon, evening and night settings, plus any time in between!

Networking for your GRO-MACS *is simple and low cost. Up to 31 Control Stations (CS) can connect to one PC. Up to 31 Zone Controllers (ZC) can connect to each CS. The modular design lets you distribute the CS and ZC as you desire—no need to run all wires back to one location. Use modems for remote sites!*



Use as a many or as few components as you need. Start with a basic system and add more as your business grows. Best of all, the GRO-MACS is so flexible that it connects to virtually all existing sensors and equipment!

ASOMA-WTC ENGINEERING, a wholly owned subsidiary of ASOMA Instruments, has over 26 years of experience in producing unique data acquisition, monitoring, control, and reporting systems. Over 500 of our units have been installed around the world for greenhouse, ambient/meteorological, and environmental monitoring. Our systems are so reliable that many them have been operating continuously for the past seven years without a single failure! ASOMA-WTC's advanced yet simple system for the horticulture and agriculture industries, GRO-MACS, was developed and perfected through years of R&D at major university and commercial sites. The GRO-MACS recently won a national greenhouse control contest hosted among major agriculture colleges in the USA.

TYPICAL GRO-MACS SPECIFICATIONS

HARDWARE:

100% configuration and display from PC (all zones, all equipment & devices, all control strategies).

Minimum PC Requirement: 486/50 Mhz, IBM-compatible wit 8 MB RAM. Control operations independent of PC for maximum reliability.

Modular design allows relatively simple add-ons. Distributed hardware throughout sites, and up to 7000^{+} zones.

LED relay control status lights on each zone controller with manual override switches.

12 standard programmable digital outputs, expandable in group of 4, 8, or 12.

3 Amp, 24 VAC low-voltage, solid-state output control relays.

NEMA-4X water-tight enclosure.

Battery-backed memory of environmental control program.

Automatic restart in case of power failure.

Supports automatic audible alarm & alarm dial-out.

SOFTWARE:

100% configuration & display from PC software (no manual manipulation of devices needed).

Turnkey software system (no programming); supports remote modem control; supports remote servicing (ASOMA-WTC offe a remote maintenance contract as option).

Operating system and control interface is MicroSoft Windows™ 3.11 or '95.

Easy-to-use, point-and-click display and configuration windows—including custom displays and user-customizable screens, even bilingual screen text.

Historical Data: automatic recording, uploading to hard drive o PC, display in tabular & graphical form.

Determine sensor failure, generate alarms, print reports on devi status and equipment usage.

Export data to spreadsheet programs, such as Excel and Lotus™

CONTROL STRATEGIES:

Optional SmartZone™ automated control uses fuzzy logic to make "intelligent" decisions for you.

Time-based control with or without setpoints.

Unlimited setpoints supported; accumulation setpoint control; rate-of-change (proportional) setpoint control; average, minimur or maximum setpoint control.

Unlimited DIF (Difference in Fahrenheit) settings.

Create any combination of sensors & device.

Unlimited morning, afternoon, evening and night settings, plus any time in between.

Set control strategies for each day of the entire growth cycle.

Manage energy consumption and stagger equipment cycles to prevent power surges.

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