GENERAL

The Excel MicroCel Controller System provides high-performance, Direct Digital Control (DDC) of HVAC mechanical systems with limited I/O point requirements. The DeltaNet R7515A/B, RP7515A/B, and R7516B MicroCel Controllers (“MicroCels”) are fully programmable, allowing them to be used for zone control and other HVAC applications. Packaged programs are furnished for control of variable air volume (VAV) terminal units and water-source heat pump units.

The MicroCel can operate stand-alone or can be networked into the Excel architecture on an RS-485 bus using Honeywell Control Network Automation Protocol (“C-NAP”). A hand-held DeltaNet CCT2190 M-Cel™ Portable Operator Terminal (“M-POT”) can be used to read operating status and values as well as to change parameters such as setpoints or minimum/maximum flows. For networked systems, data can be arranged into meaningful reports, including items such as energy use, temperatures, and occupied/unoccupied status.

FEATURES

• High-performance DDC
• Flexible hardware
• Flexible software
• Standard programs
• Low-point-density applications
• Easy installation and service
• High reliability
• Integrates into networks

DESCRIPTION

High-Performance DDC:

Stand-Alone, Dedicated DDC Control:
The MicroCel requires only an internally stored control program, analog and digital I/O devices, and a power source for stand-alone control of a connected mechanical system. A DeltaNet T7515 M-Cel™ Space Temperature Sensor ("Space Sensor") can be furnished with or without a manual setpoint adjustment and/or an occupied switch and LED to allow temperature setpoint changes and to command a return to normal control during unoccupied periods. An Excel CCT2190 M-Cel Portable Operator Terminal ("M-POT"), connected either at the Space Sensor or at the MicroCel, allows the user to read operating values and to change parameters in the program.

Networked Communications Capability:
When networked into the Excel architecture, the RS-485 Control Network Automation Protocol (“C-NAP”) communication bus allows data sharing between MicroCels. For example, the temperature measurement at a single MicroCel can be used as the input to multiple MicroCels. Similarly, a single setpoint command can be sent to multiple MicroCels, causing the settings to be changed simultaneously. Points in a MicroCel performing zone temperature control can interact with MicroCels operating central equipment such as air handling units and chillers. The communications bus allows management logging, reports, and issuing of commands from a central location.
16-Bit Resolution:
The analog input circuit in the MicroCel can resolve values to 16 bits, allowing temperature measurements in increments as small as 0.01 degree F (0.006 degree C).

20 mHz Operation:
The 20 mHz MicroCel clock provides a rapid control loop response, critical for stable and quiet airflow control in VAV terminal unit applications.

Platinum Resistance Temperature Devices (RTDs):
Platinum RTDs used with the MicroCel are low-mass, high-resistance devices that provide a rapid response to temperature changes. Platinum elements are extremely stable over time, eliminating the need for recalibration.

Proportional-Integral-Derivative (PID) Control:
The MicroCel uses PID control, which provides responsive output to the mechanical equipment depending on the rate of change in the controlled variable while eliminating the effects of offset inherent in proportional control.

Real-Time Clock:
The 24-hour, seven-day, real-time software clock in the MicroCel can be used for distributed time scheduling when the MicroCel is connected to a C-NAP Network Interface (CNI, or Excel Link).

Flexible Hardware:

Modular I/O:
The MicroCel consists of a base unit and integral expansion boards for expanded I/O point capacity. The base unit allows connecting a Space Sensor to the MicroCel and operating electric damper actuators and relays. The expansion boards increase the analog and digital I/O point capacity. Highly accurate microbridge sensors are available to measure low differential pressures for airflow control. Integral electric-to-pneumatic transducers are furnished when required to drive pneumatic actuators.

Full I/O Capability:
The electronics package provides a variety of point types for control of HVAC equipment:

Inputs:
- Low differential pressure for airflow control
- Resistive for RTD, setpoint, and feedback
- Voltage/current for transmitters
- Digital for status of dry contact closure
- Momentary contact for occupied override or tenant metering

Outputs:
- Digital triac, 24V ac, for modulating damper and modulating valve control (floating control)
- Digital relay, spdt contacts
- Analog modulating, 0 to 10V dc
- Pneumatic modulating, 3 to 15 psi (20 to 105 kPa)
- LED drive for override status indication at a Space Sensor

Flexible Software:

Fully Field Programmable:
The control language used to compile the standard control sequences furnished with the MicroCel is also used to field program the MicroCel for unique control requirements. For example, a tower cooling optimization control program could be written to operate as follows:

- The condenser supply-water temperature setpoint is established at the lowest safe level for chiller operation.
- As the cooled condenser supply-water temperature falls, the setpoint is maintained by first sequencing the tower fans off and then modulating the bypass valve to limit flow through the tower.
- If the condenser supply-water temperature approaches wet-bulb temperature, the tower fans sequence off, the bypass valve modulates closed, and the condenser supply-water setpoint is reset upward, thus saving energy when evaporative cooling is not available.
- As the condenser supply-water temperature rises or the wet-bulb temperature drops, the tower bypass valve starts modulating open to the tower.
- The wet-bulb temperature is calculated from the outdoor air temperature and humidity. These measurements can be taken locally or obtained from another MicroCel in the network.
- The pump on/off control and status can also be included in the program.

Cooling Tower Optimization Control.

Proven Programming Operators:
A proven set of operators and standard programming procedures are used to program the MicroCel. The statements and syntax are similar to the commonly used Pascal language but are simplified and tailored to building control requirements.

Custom Programs Downline Loaded:
Custom programs can be conveniently loaded at the MicroCel site or can be downline loaded from a central location using an M-Cel Portable Programming Terminal (“M-PPT”) on the RS-485 C-NAP bus.
Standard Programs:

All models of the MicroCel are available with preprogrammed control sequences for standard applications to control single- and dual-duct VAV air terminal units and water-source heat pump units. The appropriate control program is field selected and parameters are entered to configure the program to the specific unit. For example, a specific control program can be selected for single-duct, cooling-only, VAV air terminal units. With this program, the MicroCel measures duct velocity and controls the airflow in cubic feet per minute (cfm). The airflow setpoint is reset according to the temperature requirements at the Space Sensor. The MicroCel can also control reheat stages in the form of electric, hot water, or plenum return air. The dual-duct control program is selected for control of both cool and warm air to the space. It measures the airflow and controls the damper actuators for both ducts.

When furnished as part of a Honeywell Excel system, the MicroCel inputs can also monitor energy use because any parameter (for example, temperature and airflow) can be measured.

Low-Point-Density Applications:

The flexibility in the available I/O point types allows the MicroCel to be used in many low-point-density applications. Some suggested applications follow, including those that are preprogrammed, but many others are possible within the memory and point capacity of the MicroCel.

- VAV single-duct air terminal units
- VAV dual-duct air terminal units
- Water-source heat pump units
- Fan coil units
- Space flow supply/return tracking
- VAV fan control
- Constant volume discharge control
- Small air-handling unit control
- Outside make-up unit control
- Converter control
- Cooling tower control

Easy Installation and Service:

MicroCel electronics are fully enclosed in a metal chassis with conduit connections and a cover. The MicroCel is surface mounted. For VAV terminal unit applications, a MicroCel model can be furnished with an integral damper actuator that allows mounting as a single unit directly over the damper shaft extension.

All electrical connections are easily accessed by removing the MicroCel cover. Modular wiring connectors are provided at the MicroCel for both the Space Sensor and the 24V ac power and communications bus. The Space Sensor is connected to the MicroCel with a prefabricated cable and connectors. The power and C-NAP communications bus are also connected using a cable with a convenient M-Cel T-Tap. Screw terminals are used for all other sensor and actuator I/O connections to the MicroCel.
High Reliability:

Brown-out protection is provided for momentary power interruptions, transients, or spikes. The MicroCel will resume normal operation without loss of programs or setpoints. Static discharge protection is provided to 25,000V.

The MicroCel enclosure is rated for mounting in overhead plenums, providing full physical protection. The MicroCel complies with FCC rules and is UL Listed for Standards 864 and 916.

If communication with the central is lost, the MicroCel continues to operate as a stand-alone device with the intended control program. The control program and related parameters and setpoints are maintained in nonvolatile EEPROM memory so that program data is not lost on a power brownout or interruption or an extended power outage. When power resumes, the program initializes, reads the present input values and schedule, and returns the control system to the required status. No battery backup or maintenance is required.

SPECIFICATIONS

Models:
- MicroCel Controller (for details, see Excel R7515A/B, RP7515A/B, R7516B MicroCel™ Controllers Specification Data 77-0159):
  - Excel R7515A MicroCel Controller
  - Excel R7515B MicroCel Controller with Microbridge Sensor
  - Excel RP7515A MicroCel Controller with Electric-Pneumatic Transducer
  - Excel RP7515B MicroCel Controller with Microbridge Sensor and Electric-Pneumatic Transducer
  - Excel R7516B MicroCel Controller with Microbridge Sensor and Integral Damper Actuator
- Space Temperature Sensor (for details, see Excel T7515A-D M-Cel™ Space Temperature Sensors Specification Data 77-0168):
  - Excel T7515A M-Cel Space Temperature Sensor
  - Excel T7515B M-Cel Space Temperature Sensor with Setpoint Adjustment
  - Excel T7515C M-Cel Space Temperature Sensor with Override Switch/LED
  - Excel T7515D M-Cel Space Temperature Sensor with Setpoint Adjustment and Override Switch/LED
- M-POT (for details, see Excel CCT2190 M-Cel™ Portable Operator Terminal Specification Data 77-0107)
- Communications Repeater (for details, see Excel 14506597 M-Cel™ Communications Repeater Specification Data 77-0108):
  - Excel 14506597-004 M-Cel Communications Repeater without transformer
  - Excel 14506597-005 M-Cel Communications Repeater with transformer and one fused, 24V ac, 3.5A secondary circuit
  - Excel 14506597-006 M-Cel Communications Repeater with transformer and two fused, 24V ac, 3.0A secondary circuits
- Valve-actuator combination (for details, see M6410A, B Valve Actuator Specification Data 62-0100 and V5812A/V5813A Small Linear Valves Specification Data 63-2464:
  - V5812 Two Way Zone Valve
  - V5813 Three Way Zone Valve
  - M6410A Valve Actuator
- ML6161B1000 Damper Actuator (for details, see ML6161B Damper Actuator Specification Data 77-0170)

Environmental Limits:
- Temperature:
  - Shipping: –40 to 150F (–40 to 65.6C)
  - Operating: 40 to 122F (4.4 to 50.0C)
- Relative Humidity: 5 to 95% noncondensing

Input Power:
- 20 to 30V ac, 50/60 Hz, 250 mA maximum

Communications:
- Two-wire RS-485 C-NAP bus

Software Licensing:
- Before software delivery, the end user must execute a software license agreement.

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