OUT
1 2

2.0

S P   2.0

FLOW 100

| MANUAL | DISPLAY | SET PT | ▲ |
| ACK | MENU | ≡FAST | ▼ |

5 5 5

CHLORINATION/DECHLORINATION CONTROLLER

▶ Flow Pacing Control

▶ Residual Chlorine Control

▶ Compound Loop Chlorine Control

▶ Dechlorination Control

MOORE INDUSTRIES

The Interface Solution Experts
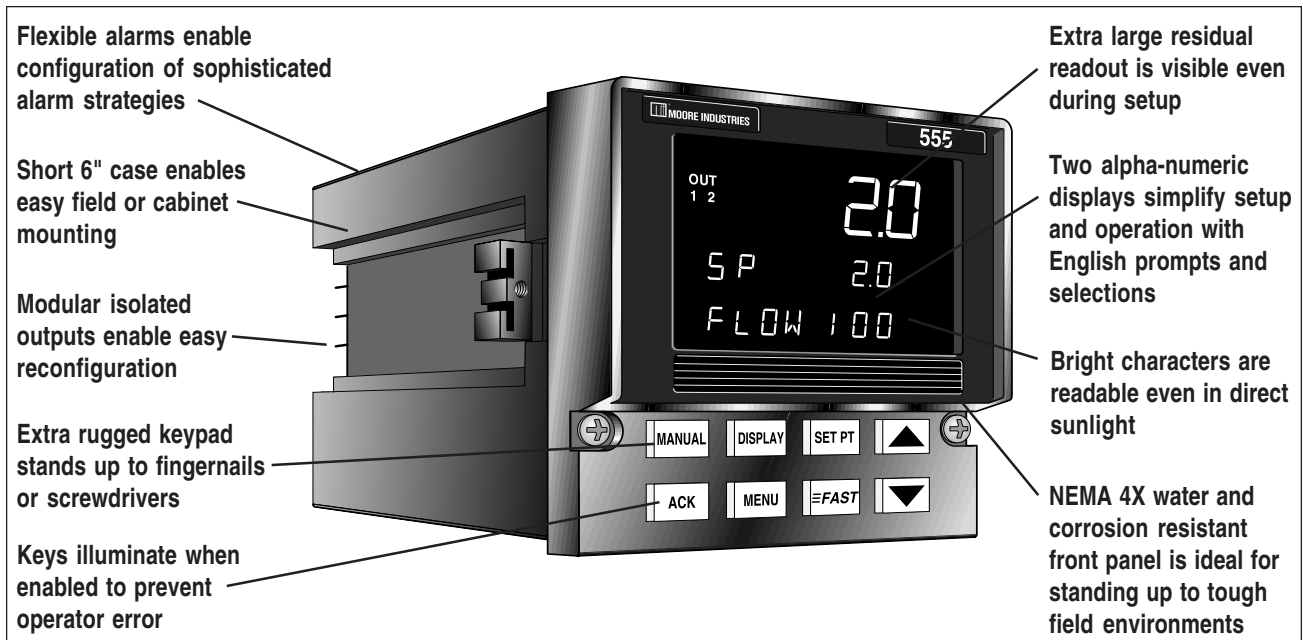**www.miinet.com**

CHLORINATION/DECHLORINATION CONTROLLER

Automatic and accurate control of chlorine in potable and waste water is more important than ever due to health and regulatory concerns. Poor control can lead to failure of biomonitoring tests leading to an even more costly "Toxicity Reduction Evaluation." The 555 is a cost-effective way to upgrade chlorination and dechlorination processes in an easy to use, rugged 1/4 DIN size package. The 555 can be easily set up to handle flow proportional control, residual control, compound loop control with lag times, and dechlorination with sulfur dioxide.
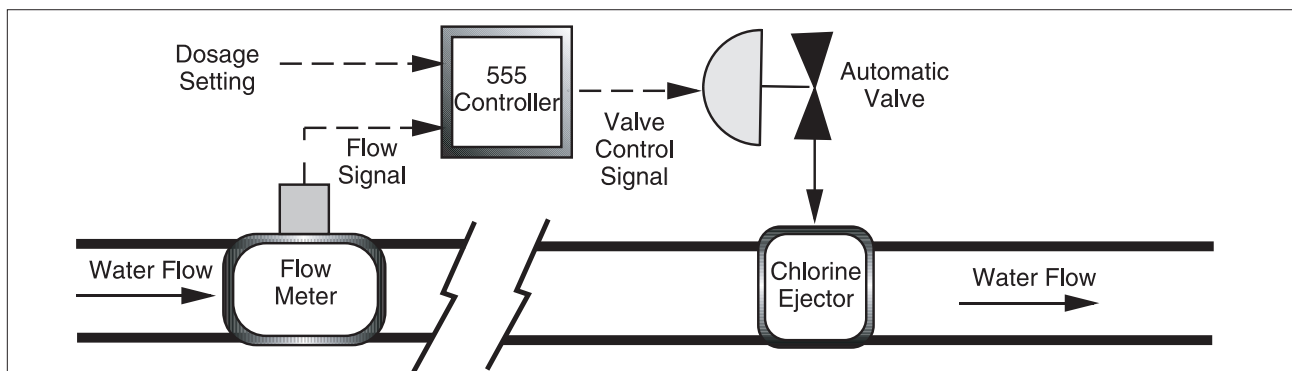
Designed with the needs of the water and wastewater industry in mind, the 555 offers features that set it apart from the competition. The front panel is NEMA 4X rated for protection from water and corrosion. The vacuum fluorescent display is bright and crisp, offering the best readability in all light conditions. All prompts are displayed in plain English with two fully alphanumeric displays. An extra large third display is dedicated to indicating one of the measured variables. When performing compound loop flow pacing control, the 555 clearly displays both flow rate and residual chlorine simultaneously. The sturdy rubber keys are large and backlit with excellent tactile feel.

The 555 is designed to quickly integrate with your flow transmitters and residual analyzers through straightforward configuration menu selections.

- Rugged construction featuring a NEMA 4X watertight front panel, illuminated raised rubber keys, bright vacuum fluorescent readout with a large five-digit upper display and two nine-character lines of alphanumerics.

- Menu selectable control strategies: flow pacing, residual, compound loop and dechlorination.

- Fixed lag time compensation capability for residual control. Fixed and variable lag time compensation capability for compound loop control.

- Selectable backup strategies for sensor failure.

- Optional High and low vacuum alarm inputs. If alarm remains closed for over 30 seconds the control valve is closed and the display indicates "NO GAS".

- Selectable square root linearization.

- Selectable alarms: high, low, deviation, rate-of-change, latching sequence, relay action, and customized alarm messages.

- User-definable security allows you to select which functions you want to secure.

Flexible alarms enable configuration of sophisticated alarm strategies

Short 6" case enables easy field or cabinet mounting

Modular isolated outputs enable easy reconfiguration

Extra rugged keypad stands up to fingernails or screwdrivers

Keys illuminate when enabled to prevent operator error

Extra large residual readout is visible even during setup

Two alpha-numeric displays simplify setup and operation with English prompts and selections

Bright characters are readable even in direct sunlight

NEMA 4X water and corrosion resistant front panel is ideal for standing up to tough field environments

FLOW PACING CHLORINE CONTROL

Flow paced (or flow-proportioning) control positions a chlorine or sulfur dioxide valve in direct proportion to the water flow rate. For chlorine, a user-defined "dosage-setting" from 0% to 400% (the percentage of gas flow to water flow) increases or decreases the rate of gas feed dependent on water flow rate. Similarly, a 0% to 400% dosage setting is also available for dechlorination with sulfur dioxide.

Both chlorination and dechlorination may be accomplished simultaneously based on the same water flow rate. Ease of use is provided by continuous readout of dosage setting and flow rate or valve position. Flow paced control is well suited for applications where the water flow rate varies but the disinfection/oxidation demand remains constant.
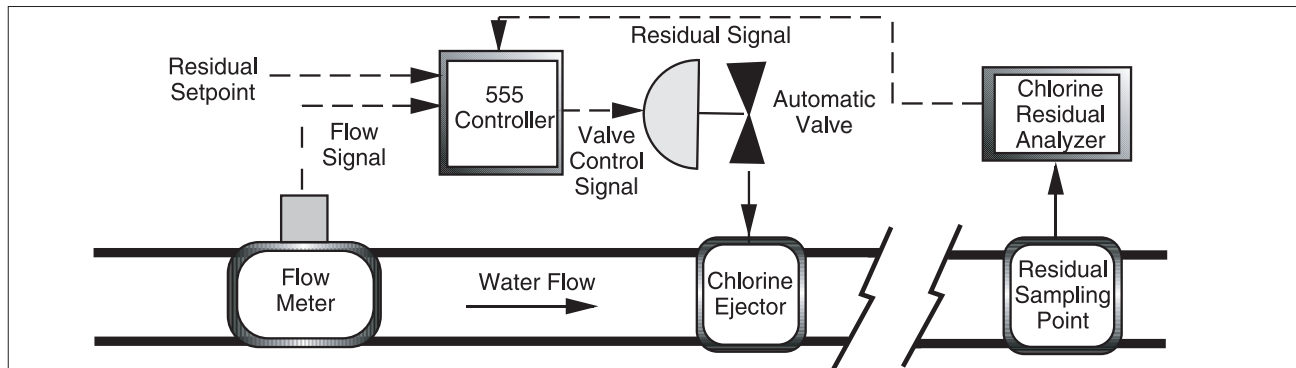
RESIDUAL CHLORINE CONTROL
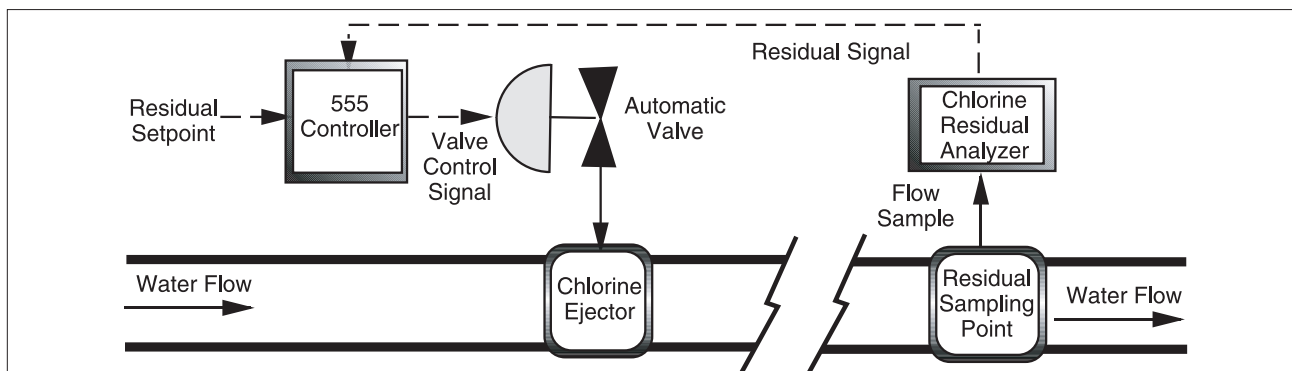
Residual control positions a chlorine valve based on chlorine residual measurement. With a user-defined residual setpoint, the 555 increases or decreases the gas feed rate dependent on deviation from setpoint. Ease of use is provided by continuous readout of chlorine residual and setpoint. Improved residual control is made possible by a fixed lag time function incorporated in the 555. Controllers without a lag time function have to be tuned for very sluggish

response to avoid oscillations or overshoot. This function compensates for the time the residual analyzer takes to sample and update its output, as well as the lag time (transportation time) between the chlorine ejector and the residual analyzer. Integral only control is used. Residual control is well suited for applications where the water flow rate is constant but the disinfection/oxidation demand varies.

COMPOUND LOOP CHLORINE CONTROL

Compound loop control positions a chlorine valve based on chlorine residual measurement and water flow measurement. The residual control signal trims (modifies) the valve position signal generated by flow proportioning control. Ease of use is provided by continuous readout of chlorine residual, residual setpoint and flow rate. Flow proportioning control continuously adjusts for water flow variations, with residual control "fine tuning" the chlorine flow at the end of each lag time period. The 555's compound loop control mode allows both a fixed and variable component to the lag time period. Typically, fixed lag time is the time for the residual analyzer to take a

sample and update its output. Variable lag time is the transportation time of water in the pipe traveling from the chlorine ejector to the residual sampling point. Variable lag time automatically compensates for changes in transportation time as the flow rate varies. Compound loop offers the best characteristics of both flow pacing and residual control: fast response to changes in water flow and fine tuning of valve position to changes in oxidation demand. Integral only control is used on residual feedback. Compound loop control is well suited for applications where water flow rate and disinfection/oxidation demand vary, or where tight control is required.

DECHLORINATION CONTROL
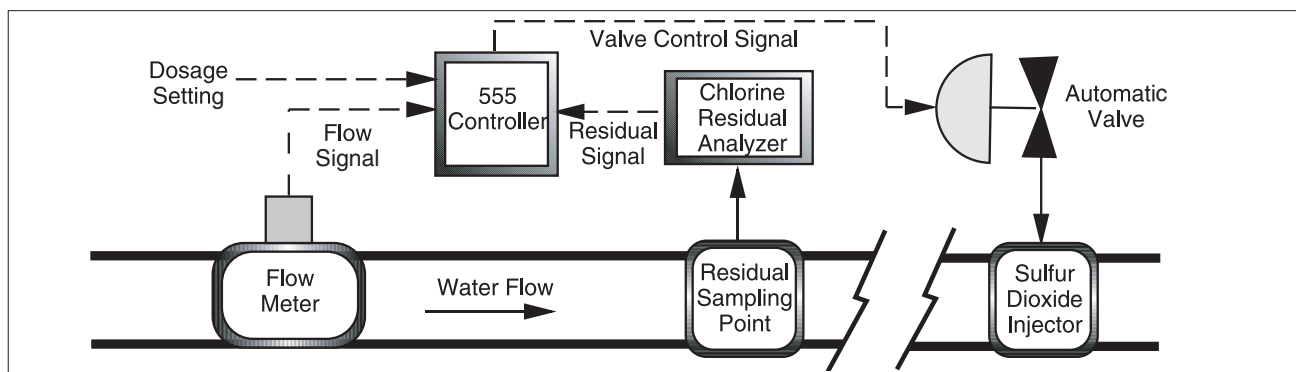
Feedforward dechlorination control positions a valve (typically sulfur dioxide) in direct proportion to the water flow rate (flow-paced on water) and residual level. With a user-defined "dosage-setting" settable from 0% to 400% (the percentage of gas flow to water flow), the 555 increases or decreases the rate

of gas feed dependent on changes in residual level or water flow rate. Ease of use is provided by continuous readout of chlorine residual, dosage setting and flow rate. Dechlorination is required to maintain the amount of free chlorine within regulatory discharge limits.

SPECIFICATIONS

ACCURACY

	TYPICAL	MAXIMUM
Linear (Voltage)	± 0.025% of full scale	± 0.100% of full scale
(Current)	± 0.050% of full scale	± 0.150% of full scale

Display accuracy is ± 1 digit.
These accuracy specifications are at reference conditions (25°C). Detailed accuracy information is available upon request.

CONTROL MODES

Flow pacing   The controller output is based on a selected chlorine, and or sulfur dioxide dosage (0-400%) which is proportional to a given flow rate.

Residual control   Integral (I) control loop based on chlorine residual sensor input with a fixed lag time calculation capability available.

Compound loop   Feedforward/feedback control loop. Flow based feedforward loop control signal is modified by the (feedback) residual control loop. Fixed and variable lag time capability can be used to delay output change, based on flow rate.

Dechlorination   Feedforward control loop where the dosage setting (0.1% to 200%) is applied to a combined signal of the flow rate **x** chlorine residual.

TUNING PARAMETERS

Proportional Band: 0.1 to 999% of input range
Integral: 1 to 9999 seconds/repeat
Manual Reset/Load Line: 0 to 100% output
Cycle Time: 0.3 to 120 seconds
Control Deadband: in engineering units
Dosage: 0 to 400%, Integral only: 0-250%
Two sets of PI values may be stored in memory and selected automatically, based on setpoint value, process variable value, or the corresponding local setpoint (SP1–SP2).
Fixed Lag: 0 to 14,400 seconds
Variable Lag: 0 to 14,400 seconds

ISOLATION

Inputs and outputs are grouped into the following blocks:

      Block 1 — Chlorine and Flow sensor
      Block 2 — outputs 1, 2, and 4
      Block 3 — communications, set of five digital inputs,
            output 3
      Block 4 — remote setpoint

Each block is electrically isolated from the other blocks to withstand a HIPOT potential of 500 Vac for 1 minute or 600 Vac for 1 second, with the exception of blocks 1 and 4, which are isolated to withstand a HIPOT potential of 50 volts peak for 1 minute between each other. Inputs and outputs are not isolated from other inputs and outputs within the same block.

PROCESS VARIABLE INPUTS

Two universal inputs are available.

TRANSMITTER/ANALYZER SIGNALS	INPUT RANGE
Milliamps DC	4 to 20
	0 to 20
Voltage DC	1 to 5
	0 to 5
Millivolts DC	0 to 10
	0 to 30
	0 to 60
	0 to 100
	–25 to 25

LINEARIZATION

The flow transmitter inputs, from Venturi tubes, Parshall flumes, Palmer Bowlus flumes and others, may be linearized using a square root function or a custom user-definable 15-point straight line linearization function. The residual signal input is linear.

INPUT IMPEDANCE

Current Input: 250 ohms
Voltage Input: 1 Mohm

UPDATE RATE

Input is sampled every 125 msec. Output is updated every 100 msec.
Display is updated five times per second.

TRANSMITTER LOOP POWER

Isolated 24 Vdc (nominal) loop power supply is available if a loop power module is installed in an output socket not used for control. Capacity is 25 mA max.

INPUT SIGNAL FAILURE PROTECTION

Preprogrammed fault handling appropriate for selected control strategy is standard:

Flow proportional chlorine control   Loss of the flow transducer signal will cause the control output to go to a user defined value.

Residual chlorine control   Loss of the chlorine analyzer signal will cause the control output to go to a user defined value.

Compound loop chlorine control   Any of the following default conditions may be chosen:

      a, Loss of signal from either the flow transducer or
      the chlorine analyzer, default to preset control output
      b, Loss of the flow signal, revert to residual
      control
      c, Loss of the chlorine residual signal, revert to
      flow proportioning control

SPECIFICATIONS (CONTINUED)

INPUT FILTER
Single pole lowpass digital filter with selectable time constant from 0 to 120 seconds.

CALIBRATION
Continuous calibration compensates for component aging due to temperature and time, except for the reference voltage. Reference calibration can be easily performed in the field with only a precision multimeter.

Process variable offset and gain factors are provided to correct for sensor errors.

OUTPUT MODULES
Up to four output modules may be installed. There are five types of output modules which can be mixed and matched to suit your particular application. The modules may be ordered factory-installed, or they may be installed in the field.

Analog module: Either 0–20 mA or 4–20 mA (front panel selectable) into a load up to 1000 ohms.

Mechanical relay module: SPDT electromechanical relay. Resistive load rated at 5 amps at 120/240 VAC. Normally open or normally closed selection is made by jumper. Output 4 is rated at 0.5 amps at 24 VAC and is always normally open.

Solid-state relay (triac) module: Resistive load rated at 1 amp at 120/240 VAC. Output 4 is rated at 0.5 amps at 24 VAC.

DC logic (SSR drive) module: "ON" voltage is 17 Vdc (nominal). "OFF" voltage is less than 0.5 Vdc.

Loop power supply module: Current is limited to 25 mA.

RETRANSMISSION OUTPUT
A retransmission output is available if an analog output module is installed in any output socket not used for control. The precise, 16-bit retransmission output may be scaled for any range. The transmitted signal can be process variable, setpoint or control output value.

ALARMS
Alarms are completely flexible. Up to two software alarms are available. High and low alarms may be sourced to the following variables: flow rate, chlorine residual, dosage setting, residual setpoint, rate of change, deviation, output, manual mode, high vacuum, low vacuum. Alarm latching is selectable.

Up to two alarm outputs are available if an associated mechanical, solid-state relay or DC logic module is installed in any output socket not used for control. An alarm output may be configured as a global alarm allowing activation by multiple software alarms.

DIGITAL INPUTS
A set of five inputs for external dry contacts or open collector transistors are available. Each can be configured to perform one of the following functions:

- Select remote setpoint or dosage
- Select manual control
- Select second local setpoint
- Select a second set of PID values
- Acknowledge alarms
- Inhibit the integral term
- Lock in manual mode
- Low vacuum alarm input
- High vacuum alarm input
- Standby mode
- Simulate front panel keys

ALTERNATE RESIDUAL SP & DOSAGE SETTING
A remote input is available. Signal is 0–20/4–20 mADC or 0–5/1–5 VDC (jumper selectable). Signal may be ratioed and biased. *Two local setpoints* may be stored in memory, selectable via SET PT key or digital contact(s).

SERIAL COMMUNICATIONS
Isolated serial communications is available using an RS-485 interface. Baud rates of up to 19,200 are selectable. The protocol supports CRC data checking. If communications is lost, a time-out feature will command the controller to a particular control mode and specific setpoint or output if desired. Outputs 2–4 and digital inputs can act as "host-controlled" I/O independent of the controller's function. May be installed in the field.

DIGITAL DISPLAYS
Upper display: five-digit, seven-segment, 15 mm (0.6 in) height. Indicates flow rate when flow pacing, residual in residual mode and either in compound or dechlorination modes.
2nd display: nine-character, 14-segment alphanumeric, 6 mm (0.25 in.) height. Indicates dosage setting or output when flow pacing and dechlorinating, residual SP, output or valve position for residual and compound control; configuration information.
3rd display: nine-character, 14-segment alphanumeric, 6 mm (0.25 in) height. Indicates second input in compound and dechlorination modes. Also displays alarm messages (first priority) and configuration information.
All displays are vacuum fluorescent. Color is blue-green.

STATUS INDICATORS
There are two types of indicators: icons and illuminated keys.
ALM 1 and ALM 2 icons: alarm 1 and alarm 2 status.
OUT 1 and OUT 2 icons: control output 1 and control output 2 status.
PV2 icon: flow is indicated in upper display.
MAN key illuminated: controller is in manual control mode.
ACK key illuminated: alarm may be acknowledged.
SET PT key illuminated: setpoint other than the primary local setpoint is active.
MENU key illuminated: controller is in the configuration mode.

DIMENSIONS
Meets 1/4 DIN designation as specified in DIN standard number 43 700. See dimensional diagram below for details.

MOUNTING
Panel-mounted. See diagram for details.

WIRING CONNECTIONS
29 screw terminals in the rear of the instrument.

POWER CONSUMPTION
15 VA at 120 VAC, 60 Hz (typical).

WEIGHT
Approximately 1 kg (2.2 lbs.).

AMBIENT TEMPERATURE
Operative Limits: 0 to 50°C (32 to 122°F).
Storage Limits: –40 to 70°C (–40 to 158°F).

RELATIVE HUMIDITY
10 to 90%, non-condensing.

VOLTAGE AND FREQUENCY
Universal power supply: 90 to 250 VAC, 48 to 62 Hz.

NOISE IMMUNITY
Common mode rejection (process input): >120 dB.
Normal mode rejection (process input): >80 dB.
AC line is double filtered and transient protected. Snubbers are provided for each relay output.

CONSTRUCTION
Case: extruded, non-perforated black anodized aluminum with ABS plastic sleeve.
Bezel: black plastic ABS.
Chassis assembly: plug-in type.
Keys: silicone rubber with diffusion printed graphics.
NEMA rating: front panel conforms to NEMA 4X when instrument is properly installed.
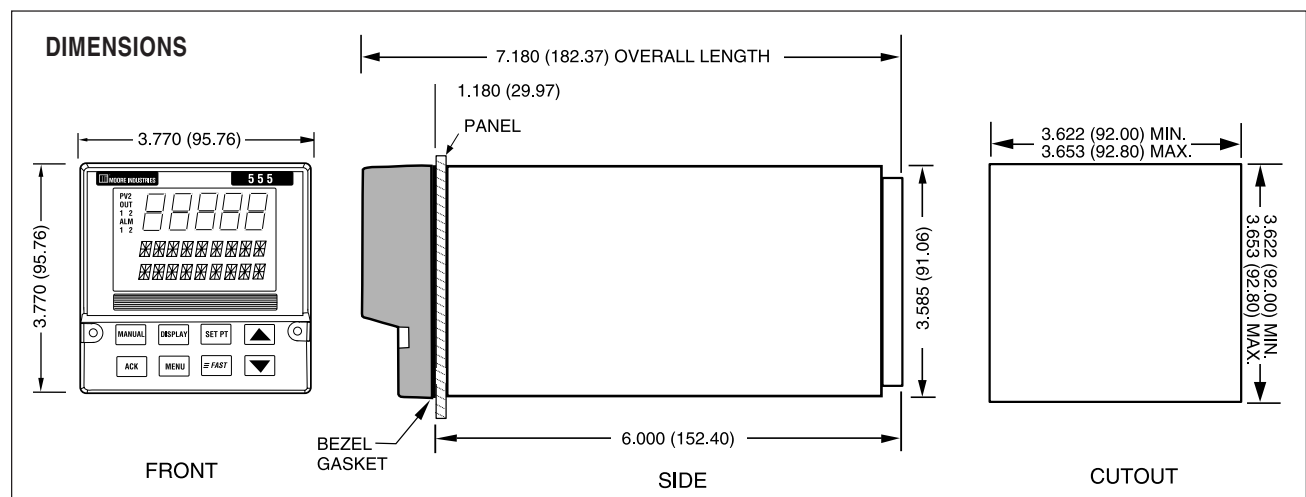
AGENCY APPROVALS

LISTED
Process Control Equipment
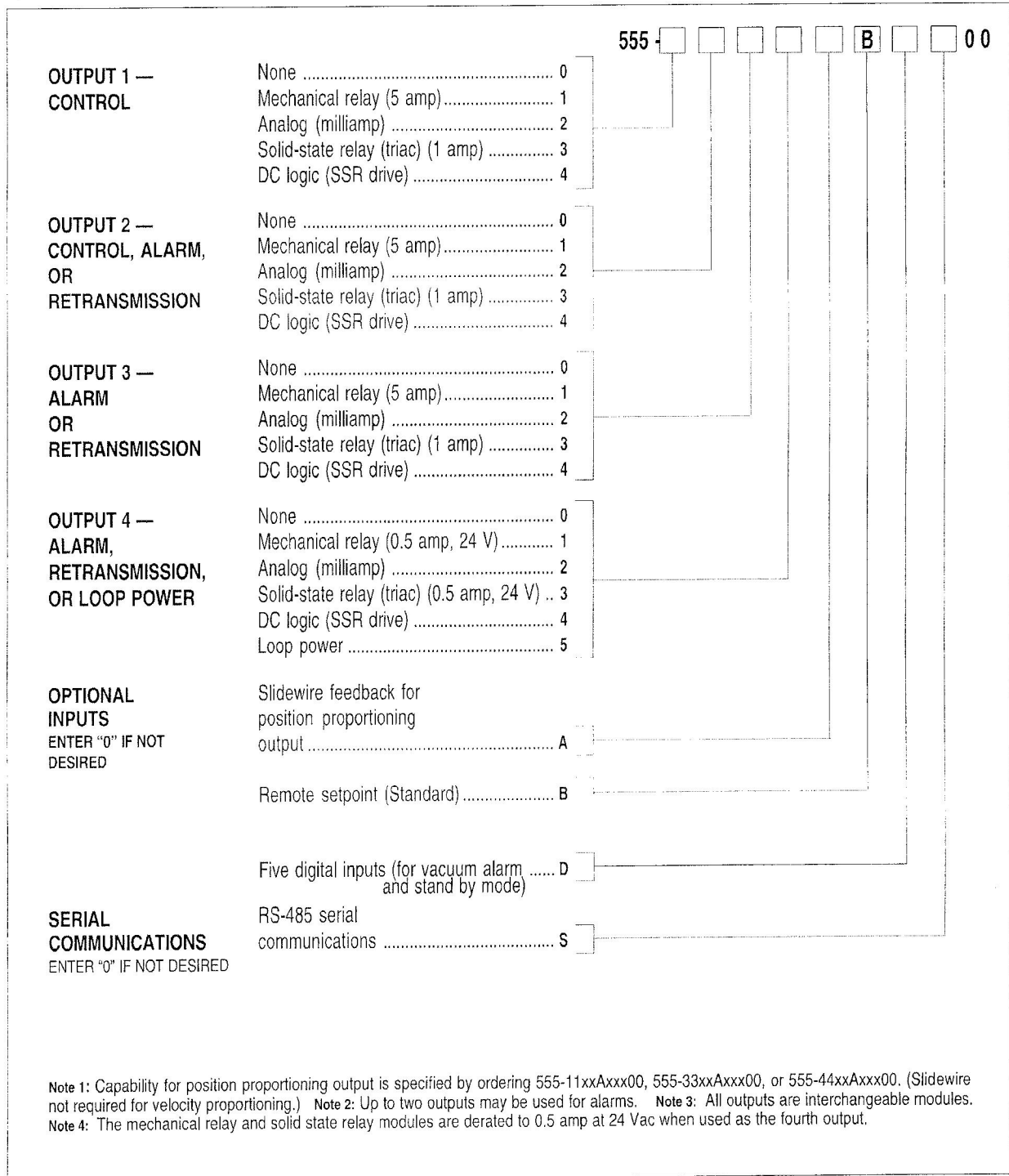4N66

MEMORY RETENTION
Lithium battery maintains all programming for approximately ten years.

SECURITY
There are two levels of access: restricted and full. A configurable code is used to enter the full access level. Functions not available in the restricted level are configurable.

DIMENSIONS

ORDERING INFORMATION

555 - ☐ ☐ ☐ ☐ ☐ B ☐ ☐ 0 0

OUTPUT 1 —
CONTROL

None	0
Mechanical relay (5 amp)	1
Analog (milliamp)	2
Solid-state relay (triac) (1 amp)	3
DC logic (SSR drive)	4

OUTPUT 2 —
CONTROL, ALARM,
OR
RETRANSMISSION

None	0
Mechanical relay (5 amp)	1
Analog (milliamp)	2
Solid-state relay (triac) (1 amp)	3
DC logic (SSR drive)	4

OUTPUT 3 —
ALARM
OR
RETRANSMISSION

None	0
Mechanical relay (5 amp)	1
Analog (milliamp)	2
Solid-state relay (triac) (1 amp)	3
DC logic (SSR drive)	4

OUTPUT 4 —
ALARM,
RETRANSMISSION,
OR LOOP POWER

None	0
Mechanical relay (0.5 amp, 24 V)	1
Analog (milliamp)	2
Solid-state relay (triac) (0.5 amp, 24 V)	3
DC logic (SSR drive)	4
Loop power	5

OPTIONAL
INPUTS
ENTER "0" IF NOT
DESIRED

Slidewire feedback for position proportioning output	A
Remote setpoint (Standard)	B
Five digital inputs (for vacuum alarm and stand by mode)	D

SERIAL
COMMUNICATIONS
ENTER "0" IF NOT DESIRED

RS-485 serial communications	S

Note 1: Capability for position proportioning output is specified by ordering 555-11xxAxxx00, 555-33xxAxxx00, or 555-44xxAxxx00. (Slidewire not required for velocity proportioning.)   **Note 2:** Up to two outputs may be used for alarms.   **Note 3:** All outputs are interchangeable modules.
Note 4: The mechanical relay and solid state relay modules are derated to 0.5 amp at 24 Vac when used as the fourth output.

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Precision Air Regulators
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Vacuum and Backpressure Regulators
I/P and E/P Transducers

BelGAS

Marshalltown-Tempco

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Temperature Switches
Capillary Bulb Type

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Multi-Loop
Process Indicators with Switches

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Control Valves – Globe Type
Temperature Regulators
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Temperature Controllers

RCS

Electric Actuators
Modulating Controllers
Spring Return – SURE
Mounting to your valves.

SVF Flow Controls, Inc.

Ball Valves – 3-piece
Pneumatic Actuators
Electric Actuators
Specialty Valves

G C VALVES

Solenoid Valves
Water – Air – Hot Water – Steam
Pilot Valves

Valve Actuator Mounting

We stock electric actuators and can provide the mounting and testing to the valve of your choice

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