General Specifications

MODEL UT750
Digital Indicating Controller
(with Custom Computation)

NEW GREEN SERIES

GS 05D01B02-01E

■ General

Model UT750 Digital Indicating Controller is an intelligent, micro-processor based digital indicating controller with powerful control capability, custom computation function and the user-friendly large numerical display. The UT750 features many functions which are necessary for various control application as standard, and all of these functions such as control function, control computation function, signal computation function, etc. can be configured by using the keys on the front panel. The instrument specifies thirteen types of control strategies built in and also the overshoot suppressing function "SUPER" and a hunting suppressing function "SUPER 2" as well as an auto-tuning as standard.

■ Main Features

- Extra-large digital display allows the indicated values to be read even from a long distance. LEDs of 20 mm height are used for the process variable display. This is a five-digit display for higher resolution.
- User-friendly full dot LCD display. Not only the target setpoint and other control related parameters but also a deviation trend record or a deviation analogue bar can be displayed.
- Thirteen types of control function, including single-loop control, cascade control, loop control with PV auto-selector, and custom computation control, enabling the operator to start control operation immediately after simply entering the settings.
- Custom Computation function, which allows users' own configuration for signals, enable them to realize such functions as complicated computation for input compensation or sequence logic.
  ("Custom Computation Building Tool <model name: LL200> is necessary to use this function.)
- Universal input and output enable users to set or change freely the type of measured inputs (thermocouple, RTD, or DCV), measurement input range, type of control output (4 to 20mA current, voltage pulse, or relay contact), etc. from the front panel.
- Equipped with seven contact inputs and outputs each, which are further expandable up to 23 inputs and outputs each by adding contact I/O signal expansion modules.
- Various communication function are provided. Communication is possible with personal computer, programable logic controller, and other controllers.

■ Functional Specifications

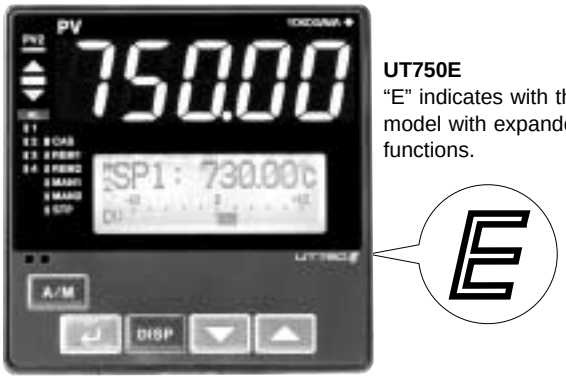
● Control Functions

UT mode

The following types of basic control structure can be set as the UT mode by the user.

Single-loop Control (UT mode 1):
The most simple and basic control function.

UT750



UT750E
"E" indicates with the model with expanded functions.

Cascade primary-loop control (UT mode 2):
Output tracking function and cascade control logic are provided. Suitable for the primary-loop cascade control.

Cascade secondary-loop control (UT mode 3):
Setpoint output and cascade control logic are provided. Suitable for the secondary-loop cascade control.

Cascade control (UT mode 4):
Dual control function for cascade control is available in a single instrument.

Loop control for back up (UT mode 5):
Output tracking function is provided to back-up another control instrument. The switching between its control output and the control output of the instrument to be backed-up can be carried out by external contact.

Loop control with PV switching (UT mode 6):
Two measured inputs are switched for control depending on the status of contact input or measured input.

Loop control with PV auto-selector (UT mode 7):
Two measured inputs are automatically selected for control with a high, low, average, or temperature-difference value selector.

Dual-loop control (UT mode 11):
Dual control function is available in a single instrument to control two loop.

Temperature and Humidity control (UT mode 12):
Temperature and Relative Humidity control is available in a single instrument.

Cascade control with two universal inputs (UT mode 13):
Cascade control with using two universal measured inputs.

Loop control with PV switching and two universal inputs (UT mode 14):
Loop control with PV switching and two universal inputs available as measured inputs.

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Loop control with PV auto-selector and two universal inputs (UT mode 15):
Process variable for loop control is automatically selected from two or three measured inputs by an internal selector, with using two universal inputs and an auxiliary analogue input. When two universal inputs are configured as measured input, auxiliary analog input can be used for a remote setting input.

Custom computation control (UT mode 21):
Can be provided by the user using the optional LL200 custom computation building tool.

● Control Computation Functions

In each UT mode, the following control computation functions can be selected.

Continuous PID control, Time-proportional PID control, Position proportional PID control(UT750-1 □ position-proportional type only), Relay ON/OFF control, Heating/Cooling control.

Target setpoint and PID parameter:
Maximum eight sets of target setpoint and PID parameters can be set and stored in a instrument. For Cascade control and Dual Loop control type, eight sets for each main and slave are available.

Zone PID selection:
Sets of PID parameters can be selected according to PV zone. Maximum seven zones can be set for selection.

Auto-tuning:
Available as standard.
Possible to activate auto-tuning for both loops of Cascade control, Dual-loop control, and Temperature and humidity control.

"SUPER" function:
Overshoots generated by abrupt changes in the target setpoint or by disturbances can be suppressed.

"SUPER 2" function:
The function stabilizes the state of control that is unstable due to hunting, etc. without requiring any change in PID constants, when the load and/or gain varies greatly, or when there is a difference between the characteristics of temperature zones.

Preset output function:
When the instrument is in STOP mode, measured input is burnout, or abnormality is found in an input circuit, users' preconfigurable preset value is output as a control output.

Control cycle time:
Each cycle time can be selected under the following coditions

50ms: Available when model code is "UT750-00", UT mode is set to Single-loop control, and the following function is not used. "SUPER" function, "SUPER 2" function, Heating/Cooling control, measured input computations, setpoint rate of change limiter, output rate of change limiter, deviation alarm, sensor grounding alarm, fault-diagnosis alarm, FAIL output.

100ms: Available when model code is UT750-0 □, UT750-1 □, (Without Cascade control)

200ms: Available when model code is UT750-5 □ and the amount of computation module of Custom computation function is less than 30.

500ms: Available when the amount of computation module of Custom computation function is more than 30.

(Set value on shipped from the factory: 200ms)

Operation Mode Switching

(Note: Communication enables all the following mode switching to be excuted.)

AUTO/MANUAL switching:
Bump-less switching is available. Switching between AUTO and MANUAL mode can be realized by using front key or by external contact, and external contact switching has priority to a front key operation.
When UT mode is set to "Cascade secondary-loop control" or "Cascade control", switching can not be realized by external contact.

RUN/STOP switching:
Switching of RUN/STOP can be realized by external contact. Bump-less switching from STOP to RUN is available. In RUN mode, control computation is activated. In STOP mode, control computation is ceased and preset output value is output as a control output, while other functions are operated normally.

REMOTE/LOCAL switching:
Switching between local setpoints and remote setpoint can be realized by instrument operation or external contact, and external contact switching is prior to instrument operation. For remote to local switching, either with bump-less tracking (to make the local setpoint value equivalent to the Remote setpoint value upon switching.) or without tracking(to switch directly to local setpoint in the instrument) can be specified by the parameter.

CASCADE/AUTO/MANUAL switching:
Switching can be realized by instrument operation or external contact, and external contact switching is prior to instrument operation. Available when UT mode is set to "Cascade secondary-loop control" or "Cascade control" .

Output tracking ON/OFF switching:
Available when UT mode is set to "Cascade primary-loop control" or " Loop control for back-up". Switching between External tracking signal and internal control output can be realized by external contact.

Control Parameter Setting Range

Proportional band: 0.1 to 999.9%
0.0 to 999.9% (for heating/cooling control.), 0.0% available for ON/OFF control

Integral time: 1 to 6,000 s, or OFF (for Manual reset)

Derivative time: 1 to 6,000 s, or OFF

ON/OFF control hysteresis:
0.0 to 100.0% of measured input range width

Preset output value: -5.0 to 105.0% of Output range
(0mA or less cannot be output)

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Output limiter:
Setting range: -5.0 to 105.0% for both high and low limits.
However, “low limit setpoint < high limit setpoint” must be satisfied.
When heating/cooling PID control, upper limiter for heating and upper limiter for cooling.
Shutdown function(For 4 to 20 mA control output only):
In manual mode operation, up to approx. 0mA can be output.
Rate of change limiter for output:
OFF, or 0.1 to 100.0%/s
Dead band of heating/cooling control:
-100.0 to 50.0% of Output value
Dead band of position-proportional control:
1.0 to 10.0 % of Output value

● Configuration of Input/Output Signal

Measured Input Computations
Bias(-100.0 to 100.0% of measuring input range), First lag filter(OFF, 1 to 120 s), Square root extraction(for voltage input only, Input low cut 0.0 to 5.0%), 10-segment linearizer function, 10-segment bias function, relative humidity calculation by wet/dry bulb(for Temperature & Humidity control type)

Auxiliary Input Computations
Applicable for remote setting input only.

Bias(-100.0 to 100.0%), First lag filter (OFF, 1 to 120s), Square root extraction (Input low cut 0.0 to 5.0%), Ratio multiplication (0.001 to 9.999)

Custom Computations
LL200 Building tool is necessary to use Custom computation function.

Combining computation function modules allows such functions as users’ own configuration of input/output signals, operation mode switching via contact input, and status output via contact output.

Computation function module:
Addition/subtraction/multiplication/division, Processing absolute value/reciprocal, Selecting maximum/minimum/average, Keeping maximum/minimum value, Keeping value, Rate of change limiter, Switch, Limiter, Constant, AND, OR, Exclusive OR, NOT, Latch, Comparison (=,<,>,≦,≧), Not equivalent, Within range, AND(word), OR(word), Shift word, Sum, Timer, Ten-segment linearizer 1/2, Inverse ten-segment linearizer 1/2, Curve linearizer 1/2, Ratio, First order lag filter, Conversion to industrial unit, Selection of PV from two inputs, Temperature and humidity calculation, MV selection1/2, Conversion of display value, Parameter setting, Data display1/2, Special contact output calculation, Assignment of output terminals 1/2, etc.
Maximum usable Number of Module:
Input custom computation 50
Output custom computation 50

● Alarm Functions

Alarm types:
PV high limit, PV low limit, Deviation high limit, Deviation low limit, Deenergized on deviation high limit, Deenergized on deviation low limit, Deviation high and low limits, High and low limits within deviation, Deenergized on PV high limit, Deenergized on PV low limit, SP high limit, SP low limit, Output high limit, Output low limit.
Alarm setting range:
PV/SP alarm: -100 to 100 % of measured input range
Deviation alarm: -100 to 100 % of measured input range width
Output alarm: -5.0 to 105.0% of output value
Alarm hysteresis: 0.0 to 100.0 % of measured input range width
Delay timer:
0.00 to 99.59 (minute, second)
An alarm is output when the delay timer expires after the alarm setpoint is reached.
Setting for each alarm is possible.
Stand-by action:
Stand-by action can be set to make PV/deviation alarm OFF during start-up or after SP change unitl SP reaches the normal region.
Timer function (stabilization of control status notification event) (Alarm 1 only):
The timer function sets alarm 1 output to ON/OFF when preset time is elapsed after PV has reached to the SP and its hysteresis band.
Activated again by RUN/STOP switching or SP switching.
Other alarm actions:
Sensor grounding alarm: Detects sensor deterioration and outputs an alarm.
Fault diagnostic alarm: Input burnout, A/D conversion error, RJC error.
FAIL output: Abnormality in software, or Abnormality in hardware.
Number of alarm settings: 4 points (for each loop)
Alarm output points: 4 points
Up to 4 points can be selected among PV, deviation, SP, output sensor grounding, fault diagnosis and FAIL alarms and output.
Timer function is available with alarm 1 output only.

Note: See the Hardware Specifications and the contents of Contact Outputs described later.

● Display and Operation Functions

PV Display Unit
Either PV1 or PV2 can be displayed on 5 digit digital display unit and switched one from the other.

Digit of display is 4 or 5 digit. For Thermocouple and RTD input, Lower digit than decimal point can be turned off.

The display range is -19999 to 30000 and the display span is 30000 or less. [750.00 appearing in the product photograph on page 1 cannot actually be displayed.]

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LCD Display Unit

Some data are displayed on LCD display unit. Each screen is called “display”.

Four types of displays are provided. Operating display, Operating parameter setting display, setup parameter setting display, and SELECT display.

Each screen of LCD display unit

Operating display:
Necessary data for operation is displayed according to UT mode. Such items as Setpoint, Control output, Control output bar-graph, deviation trend, and deviation analogue bar-graph are displayed. Memorable time of deviation trend is 120 s to 20 h.

Operating parameters setting display:
The Operating parameters, which are mainly changed during operation, such as PID constant, are displayed.

Setup parameter setting display:
The Setup parameters to configure the functions of the instrument before starting operation are displayed.
UT mode is set in this display.

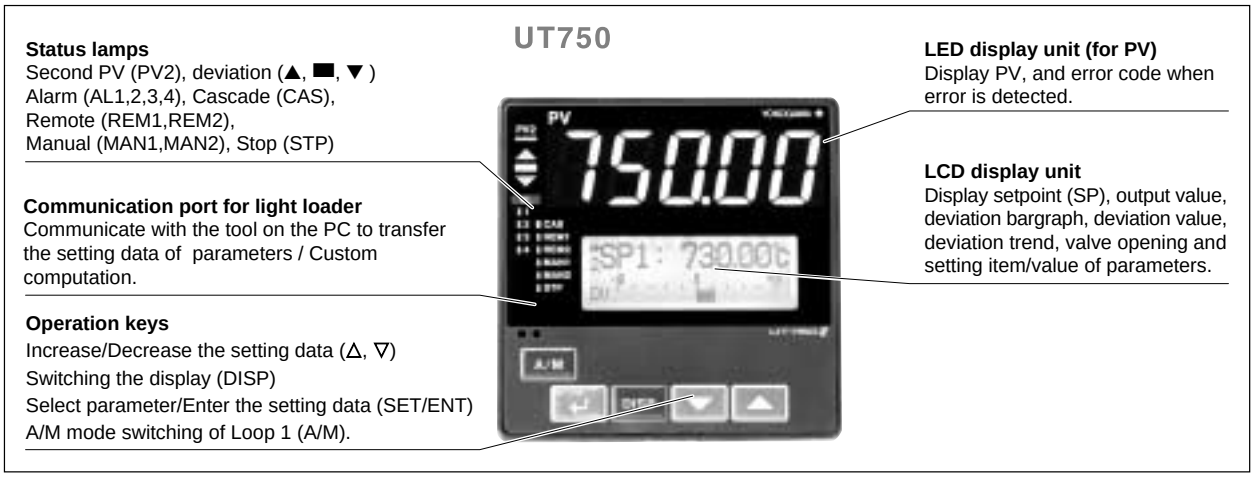
SELECT display:
Up to 5 displays which are frequently accessed can be selected from the Operating parameter setting display and Setup parameters setting display to be displayed in the SELECT display.

Status Lamps

Alarm indicating lamp: 4 points(AL1,AL2,AL3,AL4)

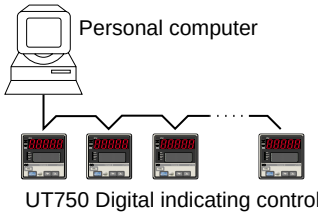
Operation mode indicating lamp:
PV 2 (PV of Loop 2), REM 1 (Remote operation of Loop 1), REM 2 (Remote operation of Loop 2), MAN 1 (Loop 1 in Manual mode operation), MAN 2 (Loop 2 in Manual mode operation), STP (Operation is ceased), CAS (Cascade operation)

Deviation indicating lamp:
▲ Plus deviation , ▼ Minus deviation, and ■ deviation in normal range
Deviation band for the display can be set.

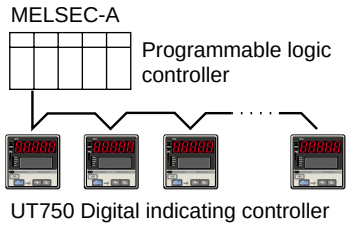


Examples of Communication System Configuration Diagram

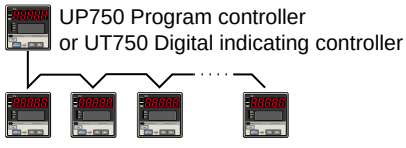
(1) Computer link communication/ MODBUS communication



(2) Ladder communication



(3) Coordinated operation



(4) Digital I/O Expansion Module (μ-BUS communication)

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Operation Keys

△, ▽ key: Increases/decreases the value of Setpoints or other parameters which appear on LCD display.
DISP key: Switch data to be showed on LCD display
SET/ENT key: Set/change the setting value, switch contents to be showed on LCD display, switch operation mode other than AUTO/MAN.
A/M key: Switch operation mode (AUTO/MAN)

Security Function

Key lock from parameter setting and operation can be inhibited by a password.

● Communication Functions

(For UT750- □1 only)

The instrument has two communication port and five types of communication protocols, and allows the simultaneous communication with two different instruments.

The instruments to communicate are a personal computer, a programmable logic controller, and other UT750/UP750.

Communication Protocol

Computer link communication:
Communication protocol with a personal computer.
Ladder communication:
Communication protocol with the ladder program on some programmable logic controllers.
Coordinated operation protocol:
Protocol to realize Coordinated operation with other GREEN SERIES controller. UT750 can be configurated as either master or slave unit.
MODBUS communication:
Communication protocol with a personal computer or PLC.
Digital input/output expansion (μ-Bus):
Protocol to connect Digital I/O expansion module to increase the number of Discrete Input and Output.

Input type		Input range code		Instrument range (°C)	Instrument range (°F)	Instrument accuracy*1
Unspecified (When shipped from the factory)		OFF		Set the data item PV input type "IN 1" to the OFF option to leave the PV input type undefined.		
Thermocouple	K	typeK1	(1)	-270.0 to 1370.0°C	-450.0 to 2500.0°F	±0.1% ±1 digit of instrument range at 0°C or more ±0.2% ±1 digit of instrument range at less than 0°C • However, ±2% ±1 digit of instrument range for type K at temperatures less than -200°C. • However, ±1% ± 1 digit of instrument range for type T at temperatures less than -200°C.
		typeK2	(2)	-270.0 to 1000.0°C	-450.0 to 2300.0°F	
		typeK3	(3)	-200.0 to 500.0°C	-200.0 to 1000.0°F	
	J	typeJ	(4)	-200.0 to 1200.0°C	-300.0 to 2300.0°F	
	T	typeT1	(5)	-270.0 to 400.0°C	-450.0 to 750.0°F	
		typeT2	(6)	0.0 to 400.0°C	-200.0 to 750.0°F	
	B	typeB	(7)	0.0 to 1800.0°C	32 to 3300°F	±0.15% ±1 digit of instrument range at 400°C or more ±5% ±1 digit of instrument range at less than 400°C
	S	typeS	(8)	0.0 to 1700.0°C	32 to 3100°F	±0.15% ± 1 digit of instrument range
	R	typeR	(9)	0.0 to 1700.0°C	32 to 3100°F	
	N	typeN	(10)	-200.0 to 1300.0°C	-300.0 to 2400.0°F	±0.1% ± 1 digit of instrument range ±0.25% ±1 digit of instrument range for temperature at less than 0°C
	E	typeE	(11)	-270.0 to 1000.0°C	-450.0 to 1800.0°F	±0.1% ±1 digit of instrument range at 0°C or more ±0.2% ±1 digit of instrument range at less than 0°C • However, ±1.5% ±1 digit of instrument range for type E at temperature less than -200°C.
	L (DIN)	typeL	(12)	-200.0 to 900.0°C	-300.0 to 1600.0°F	
	U (DIN)	typeU1	(13)	-200.0 to 400.0°C	-300.0 to 750.0°F	
		typeU2	(14)	0.0 to 400.0°C	-200.0 to 1000.0°F	
	W (DIN)	typeW	(15)	0.0 to 2300.0°C	32 to 4200°F	±0.2% ±1 digit of instrument range
	Platinel 2	plati2	(16)	0.0 to 1390.0°C	32.0 to 2500.0°F	±0.1% ± 1 digit of instrument range
	PR20-40	PR2040	(17)	0.0 to 1900.0°C	32 to 3400°F	±0.5% ±1 digit of instrument range at 800°C or more Accuracy not guaranteed for temperature less than 800°C
	W97Re3-W75Re25	W97Re3	(18)	0.0 to 2000.0°C	32 to 3600°F	±0.2% ± 1 digit of instrument range
RTD	JPt100	JPt1	(30)	-200.0 to 500.0°C	-300.0 to 1000.0°F	±0.1% ± 1 digit of instrument range (Note 1) (Note 2)
		JPt2	(31)	-150.00 to 150.00°C	-200.0 to 300.0°F	±0.2% ± 1 digit of instrument range (Note 1)
	Pt100	Pt1	(35)	-200.0 to 850.0°C	-300.0 to 1560.0°F	±0.1% ± 1 digit of instrument range (Note 1) (Note 2)
		Pt2	(36)	-200.0 to 500.0°C	-300.0 to 1000.0°F	
		Pt3	(37)	-150.00 to 150.00°C	-200.0 to 300.0°F	±0.2% ± 1 digit of instrument range (Note 1)
Standard signal	0.4 to 2V	0.4 to 2V	(40)	0.400 to 2.000 V	Display range -19999 to 30000 Display span 30000 or less (Decimal point position changeable)	±0.1% ± 1 digit of instrument range
	1 to 5V	1 to 5V	(41)	1.000 to 5.000 V		
DC voltage	0 to 2V	0 to 2V	(50)	0.000 to 2.000 V		
	0 to 10V	0 to 10V	(51)	0.00 to 10.00 V		
	0.0 to 1.2 V (Note 3)	0.0 to 1.2 V		0.000 to 1.200 V		
	-10 to 20mV	mV1	(55)	-10.00 to 20.00 mV		
	0 to100mV	mV2	(56)	0.0 to 100.0 mV		

Numbers in ( ) are the measurement input range codes that apply when the communication function is used.

*1: Performance in the standard operating conditions (at 23±2°C, 55±10% RH, and 50/60Hz power frequency)
Note 1: The accuracy is ±0.3°C of instrument range ±1 digit for a temperature range from 0 to 100°C
Note 2: The accuracy is ±0.5°C of instrument range ±1 digit for a temperature range from –100 to 200°C.
Note 3: 0.0 to 1.2 V DC range is for universal input 2 (41, 42 and 43 terminals) only.

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RS-485 Communication Interface

Two types of RS-485 communication interface(conforms to EIA RS485) available; High performance interface and general purpose interface. Both interfaces are available spontaneously according to usage.

High Performance Communication Interface:

High performance RS-485 communication is available with Computer link, Ladder, Digital input/output expansion module communication or Coordinated operation communication.

Specification(Common for Computer link, Ladder, and Coordinated operation):

Maximum number of connectable controllers: 31 units

Maximum communication distance: 1,200m

Communication method:
Two-wire half duplex, Start-stop synchronization system, Protocol free

Communication rate:
600,1200,2400,4800,9600bps,19.2k,38.4kbps.

Digital I/O Expansion Module Communication(μ-Bus):

Digital I/O expansion module communication terminals are same as high performance communicatioin terminals.

Digital I/O Expansion module:
P2ER1-20J, P2ET1-20J, P2ER6-20J, P2ET6-20J

Units to be connected: 2 units max.

Maximum communication distance: 15m max.

Communication rate: 1.25Mbps

General Purpose Communication Interface:

General purpose communication is available with Computer link, Ladder, MODBUS communication, or Coordinated operation.

Specification(Common for Computer link, Ladder, and Coordinated operation)

Maximum number of connectable controllers: 31 units

Maximum communication distance: 1200m

Communication method:
Two-wire half duplex or four-wire half duplex, Start-stop synchronization system, Protocol free

Communication rate:
600,1200,2400,4800,9600bps

■ Hardware Specifications

● Input /Ouput Signal Specifications

Measured Input Signal

Number of input: 1 or 2 points

Input type, measurement range and measurement accuracy:
Refer to the table on page 5.
Possible to select input type/measurement range by using front key or software.

Sampling period(RTD): 50, 100, 200, or 500 ms (selectable by software)
Initial value: 200 ms

Burnout detection:
Available with Thermocouple, RTD, standard signal 0.4 to 2 V and 1 to 5V input. Possible to detect upscale, downscale and off.
For standard signal, 0.1V or less are regarded as burnout.

Input bias current: 0.05μA(For T/C and RTD b terminal)

Specified current(RTD): about 0.13 mA

Input resistance:
TC/mV input: 1MΩ or more
DC Voltage input: Approx. 1MΩ
(0.0 to 1.2 V DC range for universal input 2: Approx. 8M Ω)

Allowable signal source resistance:
TC/mV input: 250 Ω or less
Effect from allowable signal source resistance: 0.1μV/Ω or less
DC Voltage input: 2kΩ or less
Effect from allowable signal source resistance: Approx. 0.01%/100Ω

Allowable leadwire resistance:
RTD 150Ω or less /wire (Lead registances of three wires must be equal.)
For -150.0 to 150.0°C range, 10Ω/wire
Effect of wiring resistance: ±0.1°C/10Ω

Allowable input voltage:
TC/mV/RTD: ±10V DC
DC Voltage: ±20V DC

Noise rejection ratio:
Normal mode: 40dB(50/60Hz) or more
Common mode: 120dB(50/60Hz) or more

RJC Error:
±1.0°C(15 to 35°C),
±1.5°C(0 to 15°C, 35 to 50°C)

Applicable standard:
TC/RTD: JIS/IEC/DIN (ITS-90)

Auxiliary Analogue Input (UT750-□1only)

Functions: Remote setpoint, Compensatory input, PV input of Cascade secondary-loop, etc.

Input type: DC voltage input 0 to 2 V DC, 0 to 10V DC, 0.4 to 2.0V DC or 1 to 5V DC (Settable within the range)

Number of input: 1 point

Sampling period: 100, 200 or 500 ms
auxiliary analog input period is linked with PV input period.
(when PV input period is 50 ms , auxiliary analog input period is 100 ms)

Input resistance: Approx. 1MΩ

Input accuracy: ±0.3% ±1 digit of F.S. for 0 to 2 V DC range
±0.2% ±1 digit of F.S. for 0 to 10 V DC range
±0.375% ±1 digit of F.S. for 0.4 to 2.0 V DC range
±0.3% ±1 digit of F.S. for 1 to 5 V DC range
Performance in the standard operating conditions (at 23±2°C, 55±10% RH, and 50/60Hz power frequency)

Feedback Resistance Input

(For UT750-1□ only. Valid for Position proportional PID control)

Slidewire resistance whole resistance 100 Ω to 2.5 kΩ (Detection of slidewire breaking is available), measuring span resistance is settable within the above range.

Measuring solution ±0.1% of whole resistance

Retransmission Output

One of measured value, setpoint, and control output is output as an analogue current signal. Selection must be done between 15 V DC loop power supply.

Number of output: 1 or 2 points (depend on selection of control output)
Retransmission output 2 is available only when “relay” is selected as the control

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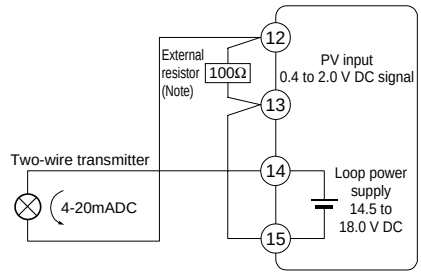
function.
Output signal: 4 to 20mA DC, 0 to 20mA DC, 20 to 4 mA DC or 20 to 0 mA DC (0 mA or less cannot be output)
Load resistance: 600 Ω or less
Output accuracy: ±0.1% of output span (±5% for 1 mA or less)
Performance in the standard operating conditions (at 23±2°C, 55±10% RH, and 50/60Hz power frequency)

When using for 1.5V DC loop power supply:

Supply voltage 14.5 to 18.0 V DC, maximum supply current about 21 mA (with the protection circuit at field short-circuit).

■15 V DC Power Supply Wiring to Two-wire Sensor



Note: Connecting a 100 Ω resistor to the terminals is optional.
Model: X010-100-2 (resistor with M3.5 crimp-on terminal lugs)

Control Outputs

One or two points can be selected from the following types, according to the model codes and specified UT mode. Just a relay contact output is available for Position-Proportional PID model(UT750-1□)

Current output
Number of output: 1 or 2 points (for heating/cooling control) (selected between voltage pulse output)
Output signal: 4 to 20mA DC, 0 to 20mA DC, 20 to 4 mA DC or 20 to 0 mA DC
Load resistance: 600 Ω or less
Output accuracy: ±0.1% of output span (±5% for 1 mA or less)
Performance in the standard operating conditions (at 23±2°C, 55±10% RH, and 50/60Hz power frequency)

Voltage pulse output
Number of output: 1 or 2 points (for heating/cooling control) (selected between current output)
Output signal: ON voltage 12V DC or more (Load resistance 600 Ω or more ; current on short-circuiting about 30mA),
OFF voltage 0.1V DC or less
Resolution: 10ms or 0.1% of output value, whichever is greater

Relay contact output
Number of output: 1 or 2 points
Output signal: Three terminals (NC, NO, and common)
Contact rating: 250V AC 3A or 30V DC 3A (Load resistance)
Resolution: 10ms or 0.1% of output value, whichever is greater

Contact Inputs

Usage: Setpoint switching, C/A/M mode switching, REMOTE/LOCAL switching, RUN/STOP switching, measured input switching, message interruption display.
Number of input: 7 points, max. 32 points (when Expanssion Digital I/O connected)
Input type: Non-voltage contact input or transistor open collector input
Input contact rating:
12V DC, 10mA or more
ON/OFF detection
For non-voltage contact input
ON=contact resistance 1kΩ or less,
OFF=contact resistance 20kΩ or more
For transistor input
ON=2V or less,
OFF=leak current 100μA or less
Minimum detecting time: PV input sampling period ×3

Contact Outputs

Usage: Alarm output, FAIL output, Cooling side output for Heating/Cooling control(Transistor contact output), Event output.
Number of output: 7 points (Relay output 3 points, Transistor contact output 4 points)
Relay contact rating: 240V AC 1A or 30V DC 1A (common to COM terminal)
Transistor contact rating: 24V DC 50mA (common to COM terminal)

Expansion Digital I/O

Up to two Digital I/O expansion modules can be connected to increase the number of Digital I/O.

Each 8 points of input/output per one module can be accessed from the instrument.

● Display Specifications

Measured value (PV) display:
5 digit seven segment red color LED display, height of the letter: 20mm
Data display:
32 × 128 dot LCD display with back-light
Status indicating lamps: LED

● Conformance to Safety and EMC Standards

Safety standard:
Conforms to IEC1010-1:1990 and EN61010-1:1992
Certified for CSA1010
The overvoltage category of each input is CAT II (IEC1010-1)
Certified for UL508
EMC standards:
Conform to the following EMC standards.
During test, the controller continues to operate with the measurement accuracy within ±20% of the range
EMI (Emission) EN55011: Class A group 1
EMS (immunity) EN50082-2:1995

● Construction, Installation, and Wiring

Construction: Dust-proof, Drip-proof Front panel comforming to IP55.
For side-by-side close installation, controller loses its dust-proof and drip-proof protection.
Material of the body:
ABS resin and polycarbonate
Case color: Black
Weight: Approx. 1kg
Dimensions: 96W×96H×100D (From the front panel

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surface) (mm)
Mounting: Direct panel mounting; mounting bracket, one each for upper and lower mounting
Panel cutout dimensions:
$92^{+0.8}_{0}$W×$92^{+0.8}_{0}$H (mm)
Mounting position:
0°to +30° with respect to vertical panel surface.
Wiring: M3.5 screw terminal(signals,power supply/ ground)

● Power Supply and Isolation

Power supply: Rated voltage 100 to 240V AC, (±10%), 50/60Hz
Power consumption: MAX.20VA (MAX.8.0W)
Memory backup: Litium Battery,
Life Time approx.10years
Withstanding voltage:
Between primary terminal and secondary terminal:
1500V AC for 1 min.(Note)
Between primary terminal and ground terminal:
1500V AC for 1 min.(Note)
Between ground terminal and secondary terminal:
1500V AC for 1 min.
Between secondary terminals:
500V AC for 1 min.

(primary terminal: Power supply, Relay output
secondary terminal: Analogue input/output, Voltage pulse output, contact input.)

Note: The withstanding voltage is specified as 2300 V AC per minute to provide a margin of safety.

Isolation Resistance: Between power supply terminal and ground 500V DC 20MΩ or more
Grounding: Class 3 grounding (grounding resistance of 100Ω or less)

Isolation Specifications

Measured input terminal 1:
Isolated from Measured input terminal 2 and other input/output terminals. Not isolated from internal circuits.
Measured input terminal 2:
Isolated from Measured input terminal 1, other input/output terminals and internal circuits.
Auxiliary analogue input terminal:
Isolated from other input/output terminals and internal circuits.
Control output (current output or voltage pulse output) and retransmission output: Not isolated between control output and retransmission output terminals. Isolated from other input/output terminals and internal circuits.
Relay contact control output terminals:
Isolated from other input/output terminals and input circuits.
Contact input terminals:
Not isolated from other contact input and communication terminals.
Isolated from other input/output terminals and internal circuits.
Relay contact alarm output terminals:
Not isolated between other Relay contact alarm output terminals. Isolated from other input/output terminals and internal circuits.
Transistor contact alarm output terminals:
Not isolated between other transistor contact alarm output terminals. Isolated from other input/output terminals and internal circuits.
RS-485 communication terminals:
Not isolated between other communication terminals, and from contact input terminals.
Isolated from other input/output terminals and internal circuits.
Feedback slidewire resistance input terminals:
Not isolated from control output(current or voltage pulse), and retransmission output terminals. Isolated from other input/output terminals and internal circuits.
Power supply terminals:
Isolated from other input/output terminals and internal circuits.
Ground terminal:
Isolated from other input/output terminals and internal circuits.

● Environmental Conditions

Normal operating conditions:
Ambient temperature: 0 to 50°C (40°C or less in close mounting side-by-side)
Temperature change rate limit: 10°C/h or less
Ambient humidity: 20 to 90%RH (no condensation)
Magnetic field: 400 A/m or less
Continuous vibration(5 to 14Hz): Peak-to-peak amplitude 1.2mm or less
Continuous vibration (14 to 150Hz): 4.9m/s^2 or less
Vibration in short period: 14.7m/s^2, 15s or less
Shock: 147m/s^2 or less, 11ms
Installation Altitude: 2000m above the sea level or less
Warm-up time: 30minutes or more
Transpotation/storage conditions:
Temperature: -25 to 70°C
Temperature change rate limit: 20°C/h or less
Humidity: 5 to 95%RH (no condensation)
Effects of operating conditions:
Effect of ambient temperature:
For Voltage/TC input: Within ±1μV/°C or ±0.01% of F.S./°C, whichever is greater.)
For Auxiliary input: Within ±0.02% of F.S./°C
For RTD input: Within ±0.05°C/°C (ambient temperature) or less
For analogue output: Within ±0.05% of F.S./°C or less
Effect of power supply fluctuation (within rated voltage):
For analogue input: Within ±1μV/10V or ±0.01% of F.S./10V, whichever is greater.)
For analogue output: Within ±0.05% of F.S./10V

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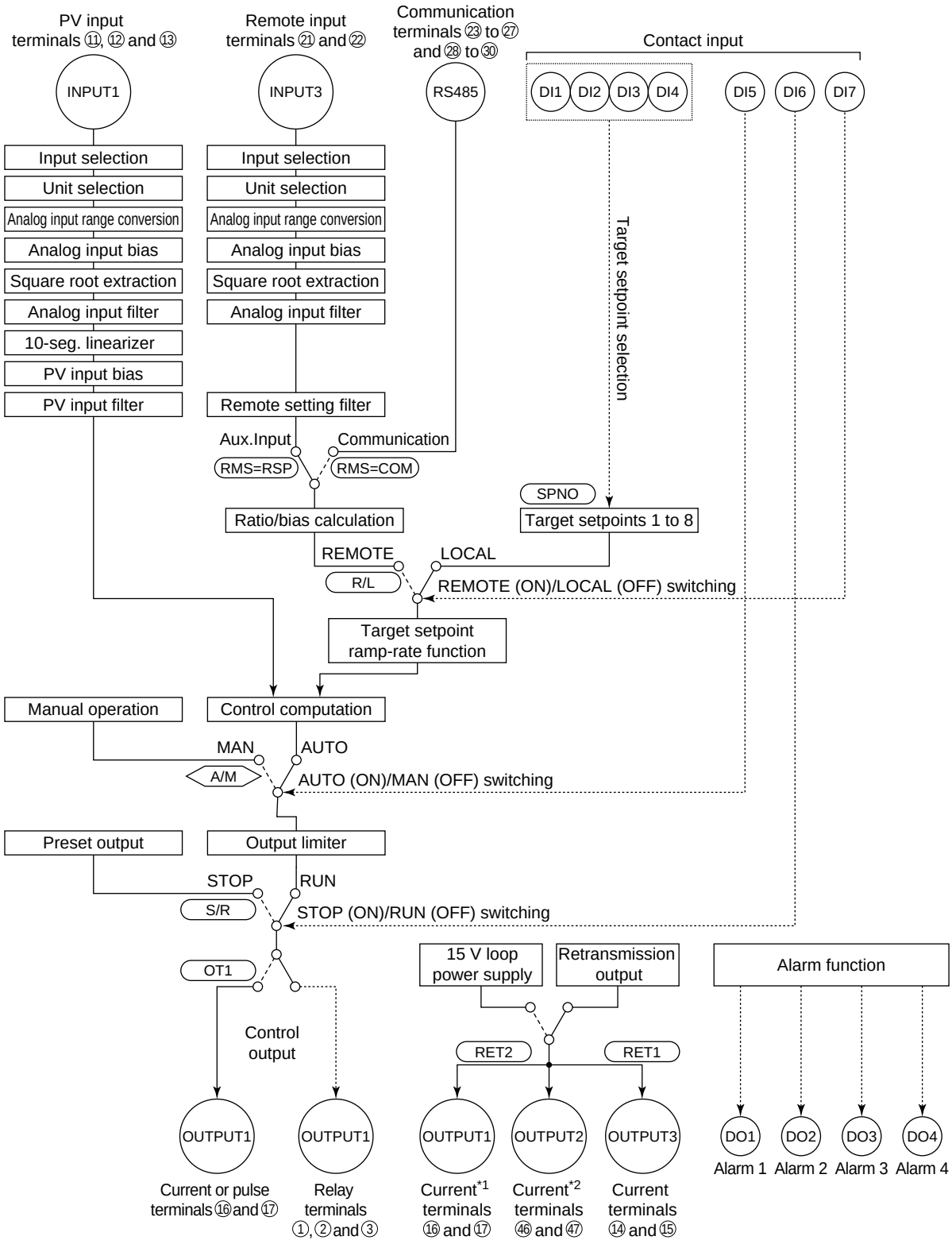
■ Function Block Diagram for Single-loop Control



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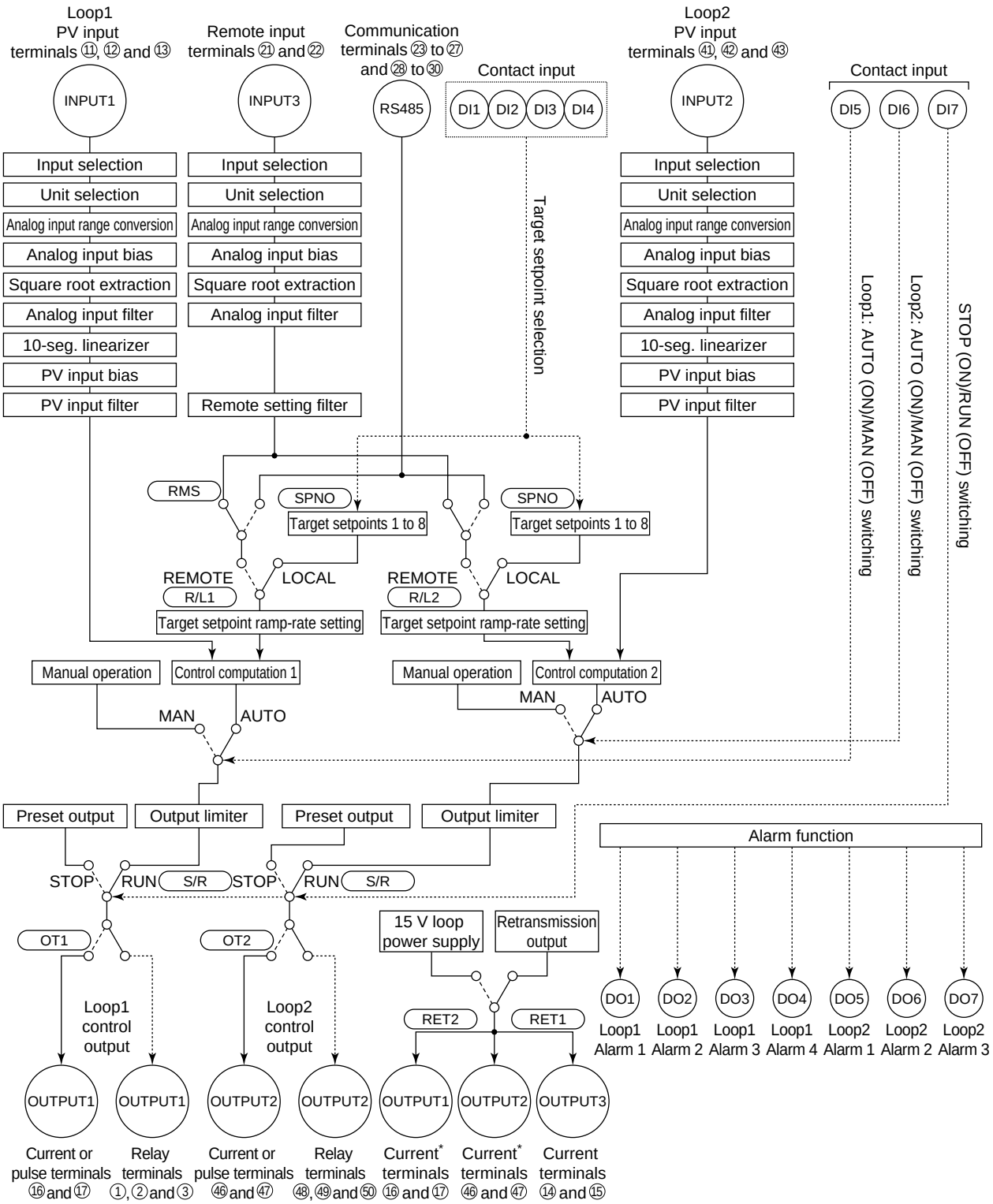
Function Block Diagram for Dual-loop Control



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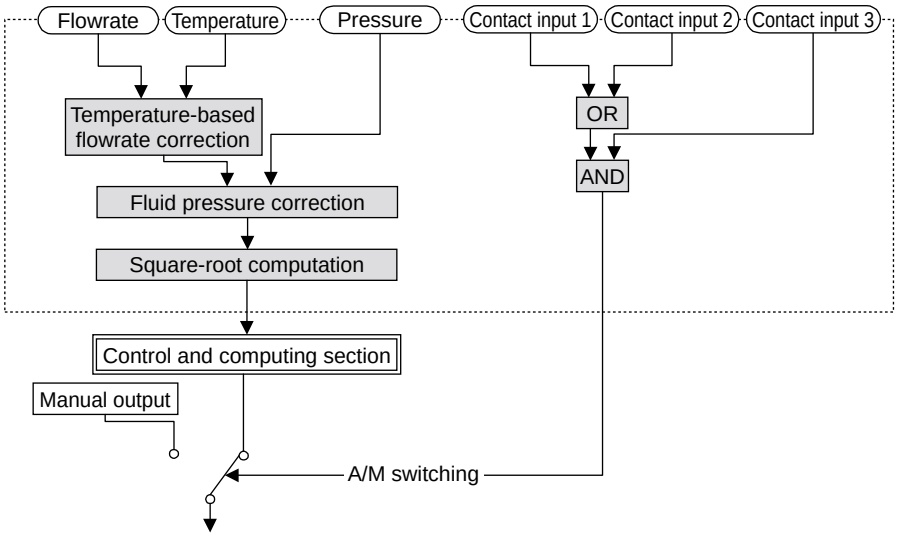
Function Block Diagram for Custom Computation

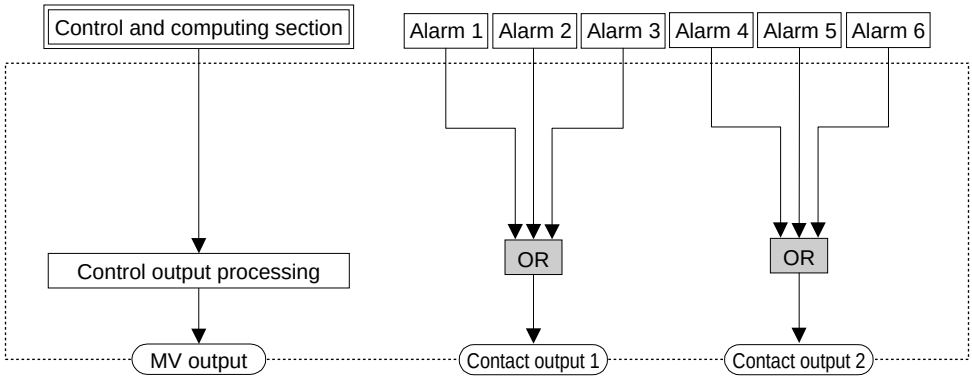
The UT750 controller comes with built-in control functions and various controller modes (UT modes) that provide different I/O computing functions. These modes are designed to support their respective control applications. From these choices, you can choose one that best meets your application needs.
In some control applications, however, you may want to execute special computations based upon specific input data or have a contact output of a specific data item in a specific control sequence. To be able to meet these needs, the UT750 controller provides a separate controller mode with which you can freely program your own computations. Computing functions available in these modes are referred to as custom computations.

Custom computations allow you to perform a variety of calculations based on input and output signals. These calculations include not only the four arithmetic operations and logical operations but also ten-segment linear approximations, temperature and humidity computations, temperature-based correction coefficient computations, pressure-based correction coefficient computations, and so on.
For example, you can use the four arithmetic operations to apply the desired type of correction to input signals, or use a logical operation to program a sequencing process that works between input and output contacts.

Custom computations are configured using the given methods of block connection, as shown in Figures below.



Custom Computations Applied to Input Signals



Custom Computations Applied to Output Signals

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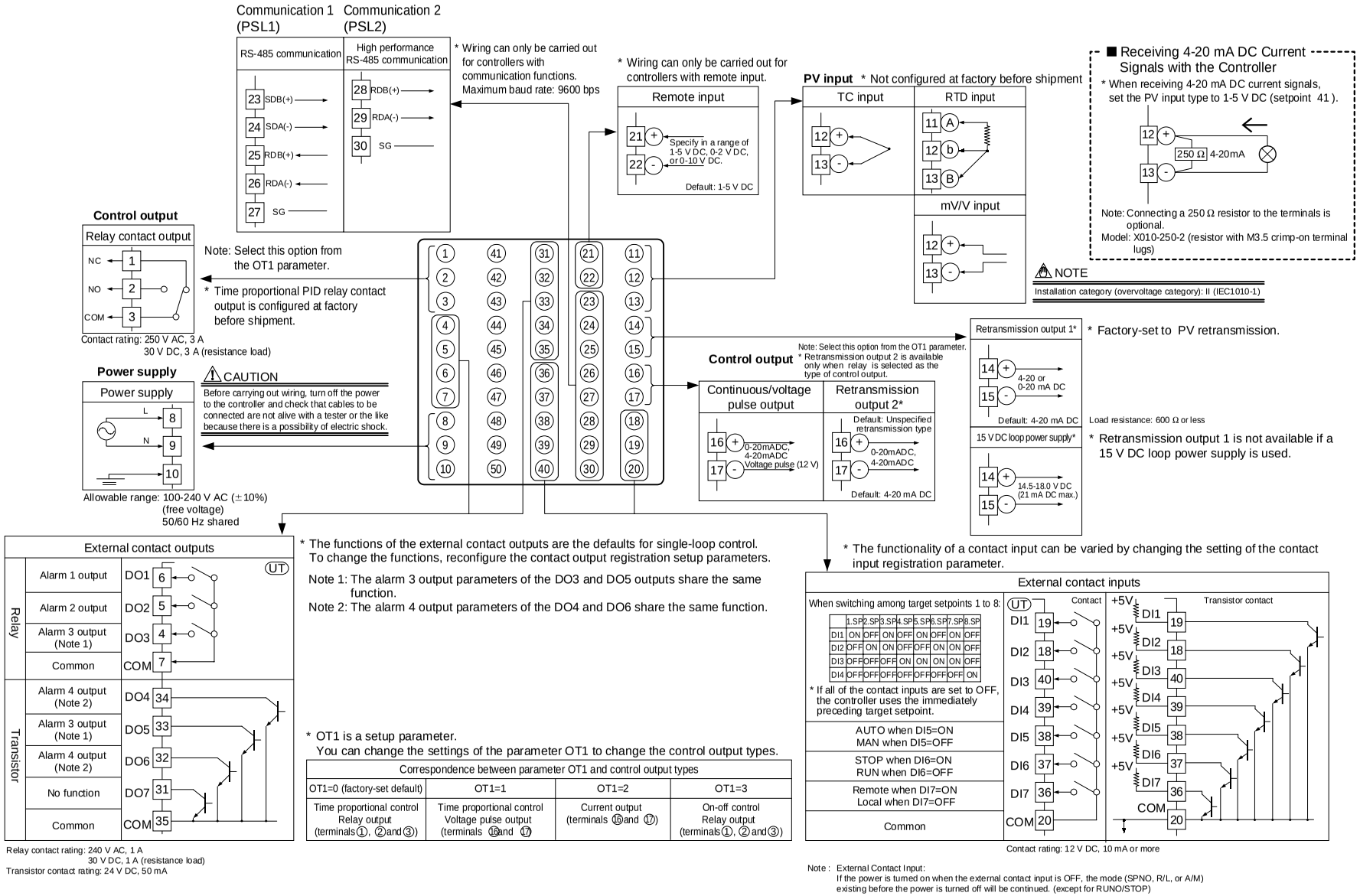
■ UT750 Single-loop Control (Model UT750-0□ or UT750-5□), Terminal Arrangements



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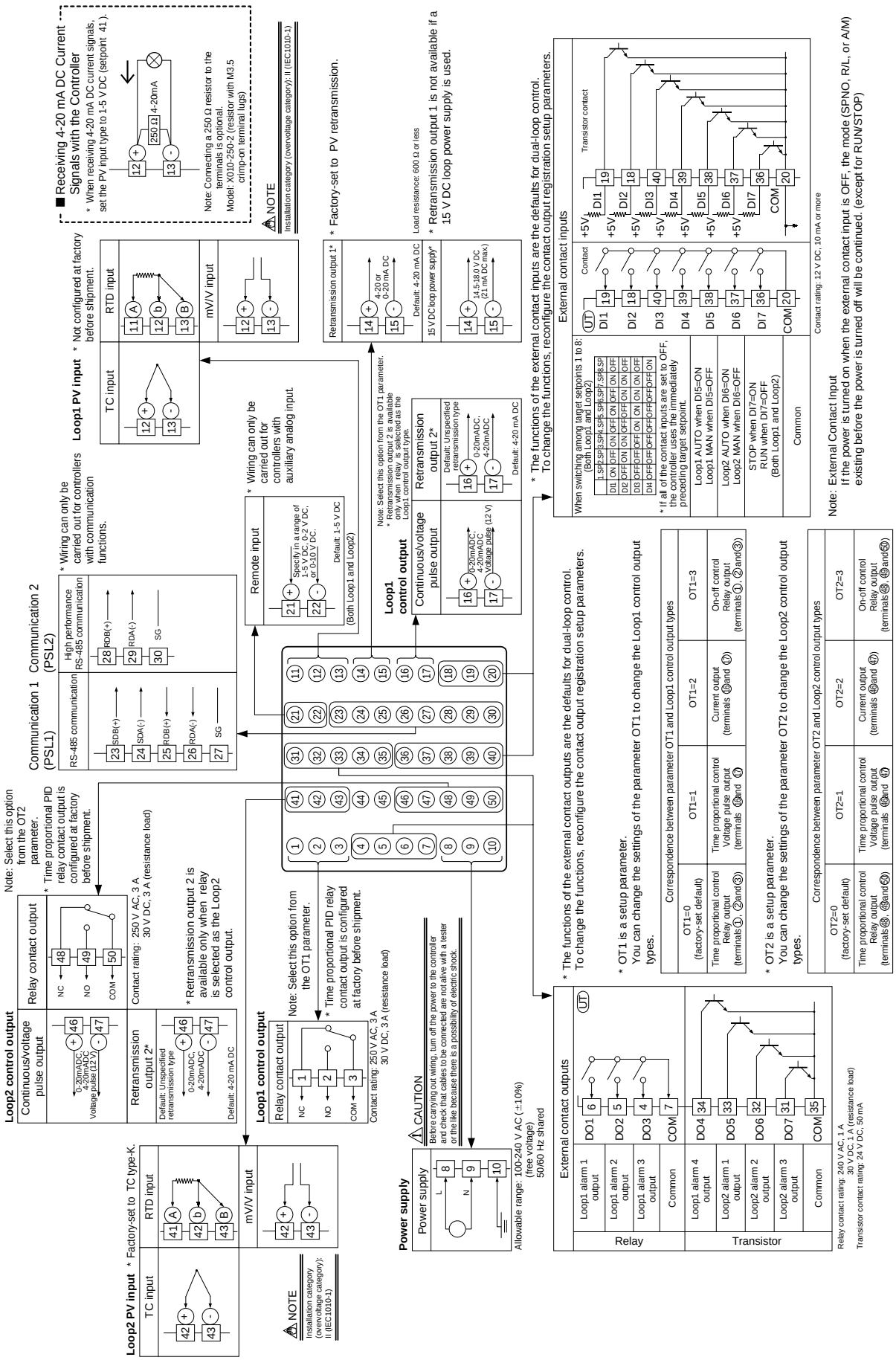
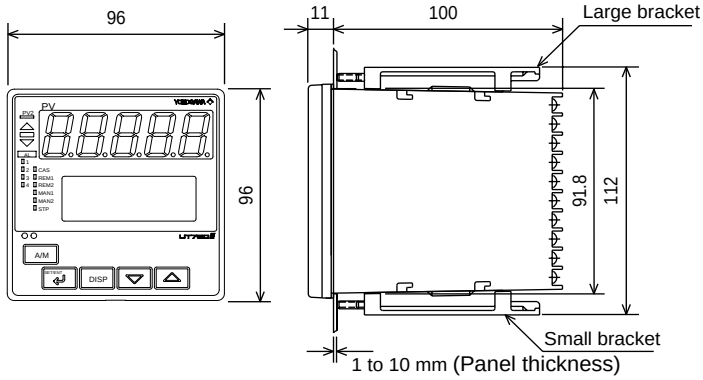
■ UT750 Dual-loop Control (Model UT750-5□), Terminal Arrangements

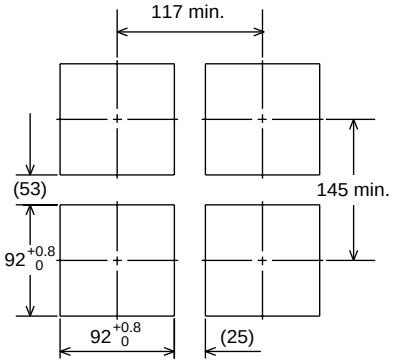


■ External Dimensions and Panel Cutout Dimension

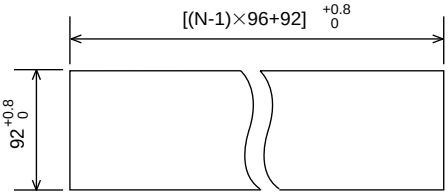
Unit: mm



General installation



Side-by-side close installation



"N" stands for the number of controllers to be installed.
However, the measured value applies if N ≥ 5.

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■ Model and Suffix codes

Model Code	Suffix &Optional Suffix Code	Description
UT750	-□□	Digital Indicating Controller (provided with Custom Computing Function)
Type	-0	Single-loop type
	-1	Position proportional type
	-5	Dual-loop type
Optional functions	0	None
	1	With communication, Auxiliary analog (remote) input

Note: Using an optional custom computation building tool (Model LL200-E10) that runs on a personal computer, you can build a variety of computation (eg., four arithmetic operations, logical operations, ten-segment linearizer computations, temperature compensation factor computations, and pressure compensation factor computations) to be applied to the controller's I/O signals.

Standard accessories: Brackets (mounting hardware), unit label, User's Manuals, and User's Manual (reference) (CD-ROM version).
Specify suffix code according to the designated UT mode.

Correspondence between UT mode and suffix code

UT mode	Suffix code→	00	01	10	11	50	51	Remarks
Single-loop control	(UT mode 1)	Cond.	App.	Cond.	App.	Cond.	App.	Cond.=Remote setpoint is not available
Cascade primary-loop control	(UT mode 2)	N/A	Cond.	N/A	N/A	N/A	App.	Cond.=Remote setpoint is not available
Cascade secondary-loop control	(UT mode 3)	N/A	App.	N/A	App.	N/A	App.	
Cascade control	(UT mode 4)	N/A	App.	N/A	App.	N/A	App.	The measured input 2 wolud be Aux.analogue input
Loop control for backup	(UT mode 5)	N/A	App.	N/A	App.	N/A	App.	
Loop control with PV switching	(UT mode 6)	N/A	App.	N/A	App.	N/A	App.	
Loop control with PV auto-selector	(UT mode 7)	N/A	App.	N/A	App.	N/A	App.	
Dual-loop control	(UT mode 11)	N/A	N/A	N/A	N/A	Cond.	App.	Cond.=Remote setpoint is not available
Temperature and humidity control	(UT mode 12)	N/A	N/A	N/A	N/A	Cond.	App.	Cond.=Remote setpoint is not available
Cascade control with two universal inputs	(UT mode 13)	N/A	N/A	N/A	N/A	Cond.	App.	Cond.=Remote setpoint is not available
Loop control with PV switching and two universal intputs	(UT mode 14)	N/A	N/A	N/A	N/A	Cond.	App.	Cond.=Remote setpoint is not available
Loop control with PV auto-selector and two universal intputs	(UT mode 15)	N/A	N/A	N/A	N/A	Cond.	App.	Cond.=Remote setpoint is not available when two measured inputs are specified as an auto-selector. App.=Remote setpoint is not available when three measured inputs are specified as an auto-selector.
Custom computation control	(UT mode 21)	App.	App.	App.	App.	App.	App.	

App.: Function available, Cond.: Function available conditionally, N/A: Function not available

Digital I/O expansion module

Model	Description	
P2ER1-20J*A	AC power supply	Inputs (8 points) and relay outputs (8 points)
P2ET1-20J*A	AC power supply	Inputs (8 points) and transistor outputs (8 points)
P2ER6-20J*A	DC power supply	Inputs (8 points) and relay outputs (8 points)
P2ET6-20J*A	DC power supply	Inputs (8 points) and transistor outputs (8 points)

Note 1: Digital I/O expansion modules manufactured by Yokagawa Electric Corporation.
Please oder to Yokagawa Electric Corporation.
Note 2: Digital I/O expansion modules do not have CE/UL marking.

■ Items to be specified when ordering

Model & suffix code, necessary/unnecessary of User's Manual or QIC.

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