Sontay®
Four Elms Road - Edenbridge
Kent - TN8 6AB - UK

Key benefits

- Slim design for room applications
- Digital connectivity using smart protocols
- Tool free installation
- No additional programming tool required
- Extensive user interface options
- Configurable input and output options

Technical Overview

Save time and cost on installation through smart connectivity. The SC series of Smart Sensors represents the next generation of total environmental sensing in one single device. The product range is designed to make installation, commissioning and operation simple and quick, while offering a comprehensive and universal range of user-configurable settings to allow the perfect fit of product and control requirements.

Features	Benefit
RS-485 data bus interface supports the communication protocols BACnet MS/TP and Modbus RTU	Low cost and robust RS-485 wiring Save on expensive physical inputs and outputs on the BMS controller. Flexibility to suit any BACnet or Modbus based control system in the industry. BACnet: Interoperability between different vendors equipment. BACnet: Approved and standard protocol by ANSI, ASHRAE and ISO.
DIP switch configuration of network parameters	BACnet MS/TP or Modbus RTU selectable via DIP switch. Wide range of different baud rates and MAC addresses selectable.
Auto-baud rate detection (BACnet only)	Detects the set baud rate of the network and adjusts the device baud rate automatically after start-up.
Auto device instance configuration (BACnet only)	Automatic device instance configuration provides out-of-the box functionality for smaller projects.
Full environmental sensing in on single device	Up to 7 sensing variables: Temperature, relative humidity, carbon dioxide, indoor air quality (TVOC), carbon monoxide, light level and PIR presence detection. Any sensors ordered with temperature and relative humidity offer psychrometric values: Enthalpy, dew point and absolute humidity.
Pluggable spring cage terminal blocks	Tool less cable termination in robust and pluggable terminal blocks. Installation time reduced to seconds, rather than minutes.
On board LED indication and advanced built-in self-test facilitates checking the sensors and the net-	Power LED, Error LED and BACnet/Modbus LEDs allow simple commissioning and fault finding. LEDs switch off after 15 minutes to avoid light intrusion in space applications.
All configurations can be made via the BACnet or Modbus network	No separate equipment or configuration tool is required.
Extensive user interface options, optional LCD screen and freely configurable 3-colour traffic light LED	Local control in the room allow room users to adjust control parameters and increase the comfort. The LCD screen keeps room occupants informed about the current sensing variables. 3-colour traffic light LED can be configured to indicate any sensing variables, such as CO2 levels, or any value via the network. The source and switching points are user configurable.
One configurable digital and analogue input by default in each sensor	The digital input can be configured as a volt free contact (NO or NC contact definition), for e.g. external occupancy detectors or fan proving switches, or pulse counting input for metering products. The pulse counting format uses contact de-bounce and is filtered. The analogue input can be configured as an additional thermistor (10K3A1) input or a 0-10Vdc input.
Two digital and three analogue outputs can be ordered as an option. The on-board test button overrides the analogue outputs.	Digital outputs intended to switch plants on/off and can be configured to be driven by the network or the momentary switch option. The analogue outputs can be configured to map sensor variables or any network value. For safety purpose, configurable fallback values can be set and override the outputs if there is a network problem. Test button allows simple identification of the output connection.

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General Specification

Supply voltage	24Vac/dc ±10%
Electrical connections	Pluggable spring loaded terminal block min. 0.2mm2, max. 1.5mm2
Communication	RS-485 (EIA-485) Protocol selectable via DIP switch
BACnet MS/TP	9k6, 19k2, 38k4, 76k8 or auto baud rate detection
Modbus RTU	9k6, 19k2, 38k4 or 57k6 baud rate 8 data bits, no parity 2 stop bits / odd parity 1 stop bit / even parity 1 stop bit selectable via DIP switch

Measurement ranges

T	-20 min to +110 max units (°C or °F), 5 pre-set ranges plus user configurable range
RH	0 to 100% RH
CO2	0 to 2,000 or 5,000ppm
IAQ	0 to 1,000ppb TVOC
CO	0 to 500ppm
LL	0-10,000 lux
PIR	PIR occupancy status

User interface options

SP	0-100%, user configurable (potentiometer tolerances ±30%)
FS	Off, Lo, Med, Hi, Auto
MS	Active/Inactive
LCD	To show T, RH, CO2 and IAQ values on a LCD screen 20 character state text editable and change of status via network
LED	"Traffic light" LED user configurable for any sensing variable or network value

Input options

AI	Analogue Input 0-10Vdc linear or NTC thermistor (10K3A1) sensor
DI	VFC or pulse count

Output options

AO	3x Analogue Output 0-10V, configurable
DO	2x Digital Output, 24Vac Triac, configurable

EMC Compliance

Emissions	EN 61000-6-3:2007+A1:2011
Immunity	EN 61000-6-2:2005

Ambient

Temperature	0 to +50°C
RH	0 to 95% non-condensing

Housing

Material	ABS (flame retardant)
Colour	Polished white finish
Dimensions	115 x 85 x 30mm
Protection	IP30
Country of origin	UK
Conformity	EMC, CE & UKCA Marked

WEEE Directive:

At the end of the products useful life please dispose as per the local regulations.
Do not dispose of with normal household waste.
Do not burn.

CE UKCA

Sensing Characteristics

Temperature T

Accuracy (20 to 40°C)	±0.5°C
Long term stability	<0.02°C p.a.
Response time	5 to 30 seconds (t 63%)

Humidity RH

Type	ASIC	
Accuracy (at 25°C)	20 to 60% RH	10 to 90% RH
	±3% RH	±4% RH
Long term stability	<0.5% RH p.a.	
Response time	8 sec. (t 63%) @ 25°C 1 m/s airflow	

Carbon Dioxide CO$_2$

Type	NDIR with ABC logic, user configurable
Measurement interval	2 seconds
Accuracy	±70ppm ±3% of reading
Pressure dependency	+1.6% reading per kPa deviation from normal pressure
Response rate	2 minutes by 90%

Indoor Air Quality IAQ

Type	MEMS Siloxane, TVOC (Total Volatile Organic Compounds)
Accuracy	Typical ±15% of measured value
Conditioning period	7 days

Carbon Monoxide CO

Type	Electrochemical sensor
Accuracy	Typical ±7% fsd.
Baseline offset	<±10ppm equivalent
Response time	max. 60 seconds (t90)

Light level LL

Type	Photodiode

Occupancy PIR

Type	Passive infrared
Detection distance	5 meters
Detection area vertical	100°
Detection area horizontal	82°

CO Sensor types:

IMPORTANT The sensor is not designed, manufactured or intended for use or re-sale as control or monitoring equipment in environments requiring life safety performance, in which the failure of the sensor could lead directly to death, personal injury, or severe physical or environmental damage. Sontay and its suppliers specifically disclaim any express or implied warranty of fitness for life safety. Sontays range of CO sensors are not to be used in domestic applications.

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Part Codes

Part code										Description
				x	x	x	x	x	x	**Space Temperature**
										Configuration sensing options RH/CO2:
				0						- none
				1						- RH
				2						-CO2
				3						-CO2 & Traffic Light LED
				4						- RH & CO2
				5						- RH, CO2 & Traffic Light LED
										Configuration sensing options CO/IAQ:
					0					-none
					1					-CO
					2					-IAQ
					3					-CO & IAQ
										Configuration user indication:
						0				- none
SC	-	S	-			1				-LCD Display
						2				- Light Level sensor
						3				- PIR sensor
						4				- Light Level & PIR sensor
										Configuration interface options:
							0			- none
							1			- SP
							2			- MS
							4			- SP & MS
							5			- SP & FS
							6			- FS & MS
							7			- SP, MS & FS
										Configuration Digital Outputs:
								0		- none
								1		- 2x DO
										Configuration Analogue Outputs:
									0	- none
									1	- 3x AO

Installation

precautions must be observed when handling these sensors. The PCB contains circuitry that can be damaged by static discharge.

Note: Sontays range of Smart Sensors are not suitable for use in swimming pool & spa applications. Sensors used in these types of applications are not covered under Sontays warranty terms. Chemicals used in swimming pool & spas can contaminate the humidity element, which results in a reduced service life.

1. Select a location on a wall of the controlled space which will give a representative sample of the prevailing room condition. Avoid sitting the sensor in direct sunlight, on an outside wall or near heat sources. An idea mounting height is 1.5m from the floor.

2. Undo the tamperproof screw at the bottom of the housing and remove the front panel from the base.

3. Using the base as a template mark the hole centres and fix to the wall with suitable screws. Alternatively the base plate can be mounted on to a conduit box or standard recessed back box. The base plate is suitable for EU & North America fixings.

4. Feed cable through the hole in the base plate of the housing, unplug the terminal block from the PCB and terminate the cores at the loose terminal block. Leave some slack inside the unit as required.

5. Plug the terminal block on the pins header on the PCB. Check polarity and orientation. Replace the housing to the base plate and tighten the tamperproof screw (if required) through the lug at the bottom of the base plate.
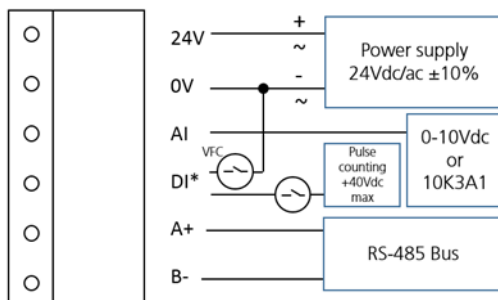
IMPORTANT!
Make sure the Terminal Block is fitted the correct position and direction. The cable entry faces the centre of the sensor.

6. Before powering the sensor, ensure that the supply voltage is within the specified tolerances

7. Allow 3 minutes before checking functionality, and at least 30 minutes before carrying out pre-commissioning checks. This will allow the electronics time to stabilise.

Electrical Connections:

24V	Supply 24Vac/dc		**DO1**	Digital Output 1
0V	Supply 0V (Common 0V)		**DO2**	Digital Output 2
AI	Analogue Input		**0V**	Common 0V
DI*	Digital Input		**OP1**	Analogue Output 1
A+	RS-485 A+		**OP2**	Analogue Output 2
B-	RS-485 B-		**OP3**	Analogue Output 3

IMPORTANT! The DI (*) can be configured to VFC or Pulse Counting. If configured for Pulse Counting do not connect 0V!

Terminal Block

For easier installation, the terminal block can be detached from the PCB.
When used with ferrules it doesn't require any tools to release the spring loaded terminal block. When used with stranded cable, push in the orange latch to compress the spring load. Feed in the wire and release the spring to secure the wire connection.

IMPORTANT! Make sure the Terminal Block is fitted the correct position and direction. The cable entry faces the centre of the sensor.
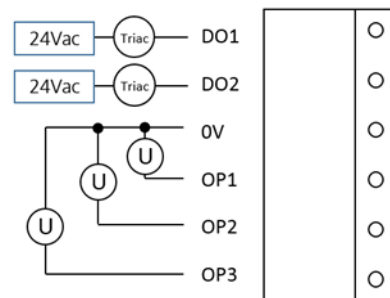
Network Cable:

Sontay recommend that Belden 9841 or 3106 cable be used for the RS-485 network bus. Similar specification cable may also be used. If other types of cable, such as CAT5, is employed, it may be necessary to switch DS2-8 (the 120Ω terminating resistor) ON for each device to obtain reliable communications.

PCB Layout and wiring diagram
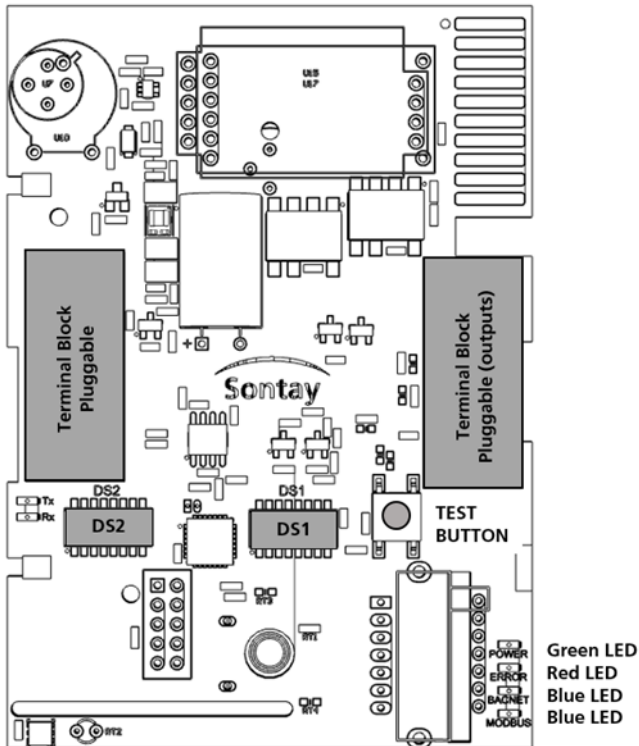
When using the digital input as a VFC, the VFC contacts should be connected across the DI terminal and the common 0v terminal, i.e. active low.

When using the digital input as a pulse counting input, the input should be connected across the DI terminal and is active high. Do NOT connect a pulse input across the DI terminal and common 0v.

The output override button can be used to manually override the mapped analogue outputs (if fitted) and the sensor input values.

— Press the override button for > 2 seconds. The mapped analogue values and the values in the BACnet AIs or Mod bus registers go to 100% of range.
— Press the override button again for > 2 seconds. The mapped analogue values and the values in the BACnet AIs or Modbus registers go to 50% of range.
— Press the override button again for > 2 seconds. The mapped analogue values and the values in the BACnet AIs or Modbus registers go to 0% of range.
— Pressing the override button again returns the sensor to normal automatic outputs. If the override button is not pressed for more than 15 seconds, the sensor returns to normal automatic outputs.

DIP switches and LED's

1. Set network settings using the network DIP switch DS2.

Setting	DS2 - 1	DS2 - 2	DS2 - 3	DS2 - 4	DS2 - 5	DS2 - 6	DS2 - 7	DS2 - 8
Auto-baud (BACnet only)	-	-	**On**	-	-	-	-	-
9600 Baud Rate	Off	Off	Off	-	-	-	-	-
19200 Baud Rate	**On**	Off	Off	-	-	-	-	-
38400 Baud Rate	Off	**On**	Off	-	-	-	-	-
57600 (Modbus) / 76800 (BACnet) Baud Rate	**On**	**On**	Off	-	-	-	-	-
Modbus Network	-	-	-	**On**	-	-	-	-
BACnet Network	-	-	-	Off	-	-	-	-
No Parity - 2 Stop Bits	-	-	-	-	Off	Off	-	-
Odd Parity - 1 Stop Bit	-	-	-	-	**On**	Off	-	-
Even Parity - 1 Stop Bit	-	-	-	-	Off	**On**	-	-
No Parity - 1 Stop Bits	-	-	-	-	**On**	**On**	-	-
No RS485 termination	-	-	-	-	-	-	-	Off
RS485 termination	-	-	-	-	-	-	-	**On**

IMPORTANT!

IMPORTANT!
— DS2-5 and DS2-6 have no effect if DS2-4 is set to BACnet.
— Auto-baud only works in BACnet mode.
— Only set DS2-8 to ON if the sensor is the last device on the RS-485 bus

The example above shows DS2 set for BACnet, 78k6 baud.

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2.   Set MAC address DIP switch DS1.

IMPORTANT: Changing any DIP switch setting while the sensor is powered will cause the sensor to reboot.

Address	DS1 - 1	DS1 - 2	DS1 - 3	DS1 - 4	DS1 - 5	DS1 - 6	DS1 - 7	DS1 - 8
0	Off	Off	Off	Off	Off	Off	Off	Off
1	**On**	Off	Off	Off	Off	Off	Off	Off
2	Off	**On**	Off	Off	Off	Off	Off	Off
4	Off	Off	**On**	Off	Off	Off	Off	Off
8	Off	Off	Off	**On**	Off	Off	Off	Off
16	Off	Off	Off	Off	**On**	Off	Off	Off
32	Off	Off	Off	Off	Off	**On**	Off	Off
64	Off	Off	Off	Off	Off	Off	**On**	Off
128	Off	Off	Off	Off	Off	Off	Off	**On**

For a full list please see the Annex on the last two pages of this user manual.

The example above shows DS1 set for an address of 23.

3.   Note the LED for fault finding and validating the installation:

IMPORTANT: All the LEDs apart from Power (green) will go off after being powered for 15 minutes.

Function	Colour	Description
Power	Green	Directly run from device power, lit when device is powered
Error	Red	Lit when self-test errors are detected
RS-485-TX	Green	Flash (~25ms per transfer) to indicate RS-485 data transactions in the given direction
RS-485-RX	Yellow	
BACnet	Blue	Indicates which network protocol is in use, errors have occurred if neither are lit.
Modbus	Blue	BACnet LED will flash whilst the auto-baud process is in progress

Trouble-Shooter's Guide

Symptom	Cause	Actions
No BACnet MS/TP Communications	PCB not powered	Check green power LED. Apply power to PCB observing correct polarity.
	BACnet not selected using DS2-4	Observe that the BACnet LED is ON. Check that DS2-4 is set to OFF.
	Incorrect address setting	Set a unique, valid address.
	Duplicate device instance	The device instance is "662" + the MAC address. Check that the device
	120Ω terminator (DS2-8) set ON	Only set the 120Ω terminator ON if the sensor is the last on the RS-485 bus.
	Incorrect baud rate	Check the baud rate switches (DS2-1 to DS2-3)
	Incorrect RS-485 wiring	Ensure A+ on the sensor is connected to A+ one each sensor and/or MS/TP
No Modbus RTU Communications	PCB not powered	Check green power LED. Apply power to PCB observing correct polarity.
	Incorrect address setting	Set a unique, valid address.
	Modbus not selected using DS2-4	Observe that the Modbus LED is ON. Check that DS2-4 is set to ON.
	120Ω terminator (DS2-8) set ON	Only set the 120Ω terminator ON if the sensor is the last on the RS-485 bus.
	Incorrect baud rate	Check the baud rate switches (DS2-1 to DS2-3)
	Incorrect parity and stop bit	Check the parity and stop bit switches (DS2-5 to DS2-6)
	Incorrect RS-485 wiring	Ensure A+ on the sensor is connected to A+ one each sensor and/or RTU

Annex – DIP Switch settings MAC address

Address	DS1.1	DS1.2	DS1.3	DS1.4	DS1.5	DS1.6	DS1.7	DS1.8
0	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
1	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF
2	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
3	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF
4	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF
5	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF
6	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF
7	ON	ON	ON	OFF	OFF	OFF	OFF	OFF
8	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF
9	ON	OFF	OFF	ON	OFF	OFF	OFF	OFF
10	OFF	ON	OFF	ON	OFF	OFF	OFF	OFF
11	ON	ON	OFF	ON	OFF	OFF	OFF	OFF
12	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF
13	ON	OFF	ON	ON	OFF	OFF	OFF	OFF
14	OFF	ON	ON	ON	OFF	OFF	OFF	OFF
15	ON	ON	ON	ON	OFF	OFF	OFF	OFF
16	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF
17	ON	OFF	OFF	OFF	ON	OFF	OFF	OFF
18	OFF	ON	OFF	OFF	ON	OFF	OFF	OFF
19	ON	ON	OFF	OFF	ON	OFF	OFF	OFF
20	OFF	OFF	ON	OFF	ON	OFF	OFF	OFF
21	ON	OFF	ON	OFF	ON	OFF	OFF	OFF
22	OFF	ON	ON	OFF	ON	OFF	OFF	OFF
23	ON	ON	ON	OFF	ON	OFF	OFF	OFF
24	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF
25	ON	OFF	OFF	ON	ON	OFF	OFF	OFF
26	OFF	ON	OFF	ON	ON	OFF	OFF	OFF
27	ON	ON	OFF	ON	ON	OFF	OFF	OFF
28	OFF	OFF	ON	ON	ON	OFF	OFF	OFF
29	ON	OFF	ON	ON	ON	OFF	OFF	OFF
30	OFF	ON	ON	ON	ON	OFF	OFF	OFF
31	ON	ON	ON	ON	ON	OFF	OFF	OFF
32	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF
33	ON	OFF	OFF	OFF	OFF	ON	OFF	OFF
34	OFF	ON	OFF	OFF	OFF	ON	OFF	OFF
35	ON	ON	OFF	OFF	OFF	ON	OFF	OFF
36	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF
37	ON	OFF	ON	OFF	OFF	ON	OFF	OFF
38	OFF	ON	ON	OFF	OFF	ON	OFF	OFF
39	ON	ON	ON	OFF	OFF	ON	OFF	OFF

Address	DS1.1	DS1.2	DS1.3	DS1.4	DS1.5	DS1.6	DS1.7	DS1.8
128	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON
129	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON
130	OFF	ON	OFF	OFF	OFF	OFF	OFF	ON
131	ON	ON	OFF	OFF	OFF	OFF	OFF	ON
132	OFF	OFF	ON	OFF	OFF	OFF	OFF	ON
133	ON	OFF	ON	OFF	OFF	OFF	OFF	ON
134	OFF	ON	ON	OFF	OFF	OFF	OFF	ON
135	ON	ON	ON	OFF	OFF	OFF	OFF	ON
136	OFF	OFF	OFF	ON	OFF	OFF	OFF	ON
137	ON	OFF	OFF	ON	OFF	OFF	OFF	ON
138	OFF	ON	OFF	ON	OFF	OFF	OFF	ON
139	ON	ON	OFF	ON	OFF	OFF	OFF	ON
140	OFF	OFF	ON	ON	OFF	OFF	OFF	ON
141	ON	OFF	ON	ON	OFF	OFF	OFF	ON
142	OFF	ON	ON	ON	OFF	OFF	OFF	ON
143	ON	ON	ON	ON	OFF	OFF	OFF	ON
144	OFF	OFF	OFF	OFF	ON	OFF	OFF	ON
145	ON	OFF	OFF	OFF	ON	OFF	OFF	ON
146	OFF	ON	OFF	OFF	ON	OFF	OFF	ON
147	ON	ON	OFF	OFF	ON	OFF	OFF	ON
148	OFF	OFF	ON	OFF	ON	OFF	OFF	ON
149	ON	OFF	ON	OFF	ON	OFF	OFF	ON
150	OFF	ON	ON	OFF	ON	OFF	OFF	ON
151	ON	ON	ON	OFF	ON	OFF	OFF	ON
152	OFF	OFF	OFF	ON	ON	OFF	OFF	ON
153	ON	OFF	OFF	ON	ON	OFF	OFF	ON
154	OFF	ON	OFF	ON	ON	OFF	OFF	ON
155	ON	ON	OFF	ON	ON	OFF	OFF	ON
156	OFF	OFF	ON	ON	ON	OFF	OFF	ON
157	ON	OFF	ON	ON	ON	OFF	OFF	ON
158	OFF	ON	ON	ON	ON	OFF	OFF	ON
159	ON	ON	ON	ON	ON	OFF	OFF	ON
160	OFF	OFF	OFF	OFF	OFF	ON	OFF	ON
161	ON	OFF	OFF	OFF	OFF	ON	OFF	ON
162	OFF	ON	OFF	OFF	OFF	ON	OFF	ON
163	ON	ON	OFF	OFF	OFF	ON	OFF	ON
164	OFF	OFF	ON	OFF	OFF	ON	OFF	ON
165	ON	OFF	ON	OFF	OFF	ON	OFF	ON
166	OFF	ON	ON	OFF	OFF	ON	OFF	ON
167	ON	ON	ON	OFF	OFF	ON	OFF	ON

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40	OFF	OFF	OFF	ON	OFF	ON	OFF	OFF
41	ON	OFF	OFF	ON	OFF	ON	OFF	OFF
42	OFF	ON	OFF	ON	OFF	ON	OFF	OFF
43	ON	ON	OFF	ON	OFF	ON	OFF	OFF
44	OFF	OFF	ON	ON	OFF	ON	OFF	OFF
45	ON	OFF	ON	ON	OFF	ON	OFF	OFF
46	OFF	ON	ON	ON	OFF	ON	OFF	OFF
47	ON	ON	ON	ON	OFF	ON	OFF	OFF
48	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF
49	ON	OFF	OFF	OFF	ON	ON	OFF	OFF
50	OFF	ON	OFF	OFF	ON	ON	OFF	OFF
51	ON	ON	OFF	OFF	ON	ON	OFF	OFF
52	OFF	OFF	ON	OFF	ON	ON	OFF	OFF
53	ON	OFF	ON	OFF	ON	ON	OFF	OFF
54	OFF	ON	ON	OFF	ON	ON	OFF	OFF
55	ON	ON	ON	OFF	ON	ON	OFF	OFF
56	OFF	OFF	OFF	ON	ON	ON	OFF	OFF
57	ON	OFF	OFF	ON	ON	ON	OFF	OFF
58	OFF	ON	OFF	ON	ON	ON	OFF	OFF
59	ON	ON	OFF	ON	ON	ON	OFF	OFF
60	OFF	OFF	ON	ON	ON	ON	OFF	OFF
61	ON	OFF	ON	ON	ON	ON	OFF	OFF
62	OFF	ON	ON	ON	ON	ON	OFF	OFF
63	ON	ON	ON	ON	ON	ON	OFF	OFF
64	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF
65	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF
66	OFF	ON	OFF	OFF	OFF	OFF	ON	OFF
67	ON	ON	OFF	OFF	OFF	OFF	ON	OFF
68	OFF	OFF	ON	OFF	OFF	OFF	ON	OFF
69	ON	OFF	ON	OFF	OFF	OFF	ON	OFF
70	OFF	ON	ON	OFF	OFF	OFF	ON	OFF
71	ON	ON	ON	OFF	OFF	OFF	ON	OFF
72	OFF	OFF	OFF	ON	OFF	OFF	ON	OFF
73	ON	OFF	OFF	ON	OFF	OFF	ON	OFF
74	OFF	ON	OFF	ON	OFF	OFF	ON	OFF
75	ON	ON	OFF	ON	OFF	OFF	ON	OFF
76	OFF	OFF	ON	ON	OFF	OFF	ON	OFF
77	ON	OFF	ON	ON	OFF	OFF	ON	OFF
78	OFF	ON	ON	ON	OFF	OFF	ON	OFF
79	ON	ON	ON	ON	OFF	OFF	ON	OFF
80	OFF	OFF	OFF	OFF	ON	OFF	ON	OFF
81	ON	OFF	OFF	OFF	ON	OFF	ON	OFF
82	OFF	ON	OFF	OFF	ON	OFF	ON	OFF
83	ON	ON	OFF	OFF	ON	OFF	ON	OFF
84	OFF	OFF	ON	OFF	ON	OFF	ON	OFF

168	OFF	OFF	OFF	ON	OFF	ON	OFF	ON
169	ON	OFF	OFF	ON	OFF	ON	OFF	ON
170	OFF	ON	OFF	ON	OFF	ON	OFF	ON
171	ON	ON	OFF	ON	OFF	ON	OFF	ON
172	OFF	OFF	ON	ON	OFF	ON	OFF	ON
173	ON	OFF	ON	ON	OFF	ON	OFF	ON
174	OFF	ON	ON	ON	OFF	ON	OFF	ON
175	ON	ON	ON	ON	OFF	ON	OFF	ON
176	OFF	OFF	OFF	OFF	ON	ON	OFF	ON
177	ON	OFF	OFF	OFF	ON	ON	OFF	ON
178	OFF	ON	OFF	OFF	ON	ON	OFF	ON
179	ON	ON	OFF	OFF	ON	ON	OFF	ON
180	OFF	OFF	ON	OFF	ON	ON	OFF	ON
181	ON	OFF	ON	OFF	ON	ON	OFF	ON
182	OFF	ON	ON	OFF	ON	ON	OFF	ON
183	ON	ON	ON	OFF	ON	ON	OFF	ON
184	OFF	OFF	OFF	ON	ON	ON	OFF	ON
185	ON	OFF	OFF	ON	ON	ON	OFF	ON
186	OFF	ON	OFF	ON	ON	ON	OFF	ON
187	ON	ON	OFF	ON	ON	ON	OFF	ON
188	OFF	OFF	ON	ON	ON	ON	OFF	ON
189	ON	OFF	ON	ON	ON	ON	OFF	ON
190	OFF	ON	ON	ON	ON	ON	OFF	ON
191	ON	ON	ON	ON	ON	ON	OFF	ON
192	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON
193	ON	OFF	OFF	OFF	OFF	OFF	ON	ON
194	OFF	ON	OFF	OFF	OFF	OFF	ON	ON
195	ON	ON	OFF	OFF	OFF	OFF	ON	ON
196	OFF	OFF	ON	OFF	OFF	OFF	ON	ON
197	ON	OFF	ON	OFF	OFF	OFF	ON	ON
198	OFF	ON	ON	OFF	OFF	OFF	ON	ON
199	ON	ON	ON	OFF	OFF	OFF	ON	ON
200	OFF	OFF	OFF	ON	OFF	OFF	ON	ON
201	ON	OFF	OFF	ON	OFF	OFF	ON	ON
202	OFF	ON	OFF	ON	OFF	OFF	ON	ON
203	ON	ON	OFF	ON	OFF	OFF	ON	ON
204	OFF	OFF	ON	ON	OFF	OFF	ON	ON
205	ON	OFF	ON	ON	OFF	OFF	ON	ON
206	OFF	ON	ON	ON	OFF	OFF	ON	ON
207	ON	ON	ON	ON	OFF	OFF	ON	ON
208	OFF	OFF	OFF	OFF	ON	OFF	ON	ON
209	ON	OFF	OFF	OFF	ON	OFF	ON	ON
210	OFF	ON	OFF	OFF	ON	OFF	ON	ON
211	ON	ON	OFF	OFF	ON	OFF	ON	ON
212	OFF	OFF	ON	OFF	ON	OFF	ON	ON

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85	ON	OFF	ON	OFF	ON	OFF	ON	OFF	213	ON	OFF	ON	OFF	ON	OFF	ON	ON
86	OFF	ON	ON	OFF	ON	OFF	ON	OFF	214	OFF	ON	ON	OFF	ON	OFF	ON	ON
87	ON	ON	ON	OFF	ON	OFF	ON	OFF	215	ON	ON	ON	OFF	ON	OFF	ON	ON
88	OFF	OFF	OFF	ON	ON	OFF	ON	OFF	216	OFF	OFF	OFF	ON	ON	OFF	ON	ON
89	ON	OFF	OFF	ON	ON	OFF	ON	OFF	217	ON	OFF	OFF	ON	ON	OFF	ON	ON
90	OFF	ON	OFF	ON	ON	OFF	ON	OFF	218	OFF	ON	OFF	ON	ON	OFF	ON	ON
91	ON	ON	OFF	ON	ON	OFF	ON	OFF	219	ON	ON	OFF	ON	ON	OFF	ON	ON
92	OFF	OFF	ON	ON	ON	OFF	ON	OFF	220	OFF	OFF	ON	ON	ON	OFF	ON	ON
93	ON	OFF	ON	ON	ON	OFF	ON	OFF	221	ON	OFF	ON	ON	ON	OFF	ON	ON
94	OFF	ON	ON	ON	ON	OFF	ON	OFF	222	OFF	ON	ON	ON	ON	OFF	ON	ON
95	ON	ON	ON	ON	ON	OFF	ON	OFF	223	ON	ON	ON	ON	ON	OFF	ON	ON
96	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	224	OFF	OFF	OFF	OFF	OFF	ON	ON	ON
97	ON	OFF	OFF	OFF	OFF	ON	ON	OFF	225	ON	OFF	OFF	OFF	OFF	ON	ON	ON
98	OFF	ON	OFF	OFF	OFF	ON	ON	OFF	226	OFF	ON	OFF	OFF	OFF	ON	ON	ON
99	ON	ON	OFF	OFF	OFF	ON	ON	OFF	227	ON	ON	OFF	OFF	OFF	ON	ON	ON
100	OFF	OFF	ON	OFF	OFF	ON	ON	OFF	228	OFF	OFF	ON	OFF	OFF	ON	ON	ON
101	ON	OFF	ON	OFF	OFF	ON	ON	OFF	229	ON	OFF	ON	OFF	OFF	ON	ON	ON
102	OFF	ON	ON	OFF	OFF	ON	ON	OFF	230	OFF	ON	ON	OFF	OFF	ON	ON	ON
103	ON	ON	ON	OFF	OFF	ON	ON	OFF	231	ON	ON	ON	OFF	OFF	ON	ON	ON
104	OFF	OFF	OFF	ON	OFF	ON	ON	OFF	232	OFF	OFF	OFF	ON	OFF	ON	ON	ON
105	ON	OFF	OFF	ON	OFF	ON	ON	OFF	233	ON	OFF	OFF	ON	OFF	ON	ON	ON
106	OFF	ON	OFF	ON	OFF	ON	ON	OFF	234	OFF	ON	OFF	ON	OFF	ON	ON	ON
107	ON	ON	OFF	ON	OFF	ON	ON	OFF	235	ON	ON	OFF	ON	OFF	ON	ON	ON
108	OFF	OFF	ON	ON	OFF	ON	ON	OFF	236	OFF	OFF	ON	ON	OFF	ON	ON	ON
109	ON	OFF	ON	ON	OFF	ON	ON	OFF	237	ON	OFF	ON	ON	OFF	ON	ON	ON
110	OFF	ON	ON	ON	OFF	ON	ON	OFF	238	OFF	ON	ON	ON	OFF	ON	ON	ON
111	ON	ON	ON	ON	OFF	ON	ON	OFF	239	ON	ON	ON	ON	OFF	ON	ON	ON
112	OFF	OFF	OFF	OFF	ON	ON	ON	OFF	240	OFF	OFF	OFF	OFF	ON	ON	ON	ON
113	ON	OFF	OFF	OFF	ON	ON	ON	OFF	241	ON	OFF	OFF	OFF	ON	ON	ON	ON
114	OFF	ON	OFF	OFF	ON	ON	ON	OFF	242	OFF	ON	OFF	OFF	ON	ON	ON	ON
115	ON	ON	OFF	OFF	ON	ON	ON	OFF	243	ON	ON	OFF	OFF	ON	ON	ON	ON
116	OFF	OFF	ON	OFF	ON	ON	ON	OFF	244	OFF	OFF	ON	OFF	ON	ON	ON	ON
117	ON	OFF	ON	OFF	ON	ON	ON	OFF	245	ON	OFF	ON	OFF	ON	ON	ON	ON
118	OFF	ON	ON	OFF	ON	ON	ON	OFF	246	OFF	ON	ON	OFF	ON	ON	ON	ON
119	ON	ON	ON	OFF	ON	ON	ON	OFF	247	ON	ON	ON	OFF	ON	ON	ON	ON
120	OFF	OFF	OFF	ON	ON	ON	ON	OFF	248	OFF	OFF	OFF	ON	ON	ON	ON	ON
121	ON	OFF	OFF	ON	ON	ON	ON	OFF	249	ON	OFF	OFF	ON	ON	ON	ON	ON
122	OFF	ON	OFF	ON	ON	ON	ON	OFF	250	OFF	ON	OFF	ON	ON	ON	ON	ON
123	ON	ON	OFF	ON	ON	ON	ON	OFF	251	ON	ON	OFF	ON	ON	ON	ON	ON
124	OFF	OFF	ON	ON	ON	ON	ON	OFF	252	OFF	OFF	ON	ON	ON	ON	ON	ON
125	ON	OFF	ON	ON	ON	ON	ON	OFF	253	ON	OFF	ON	ON	ON	ON	ON	ON
126	OFF	ON	ON	ON	ON	ON	ON	OFF	254	OFF	ON	ON	ON	ON	ON	ON	ON
127	ON	ON	ON	ON	ON	ON	ON	OFF	255	ON	ON	ON	ON	ON	ON	ON	ON

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