Intech Micro 2300-MULTI analogue input station MODBUS RTU slave application supplementary manual.

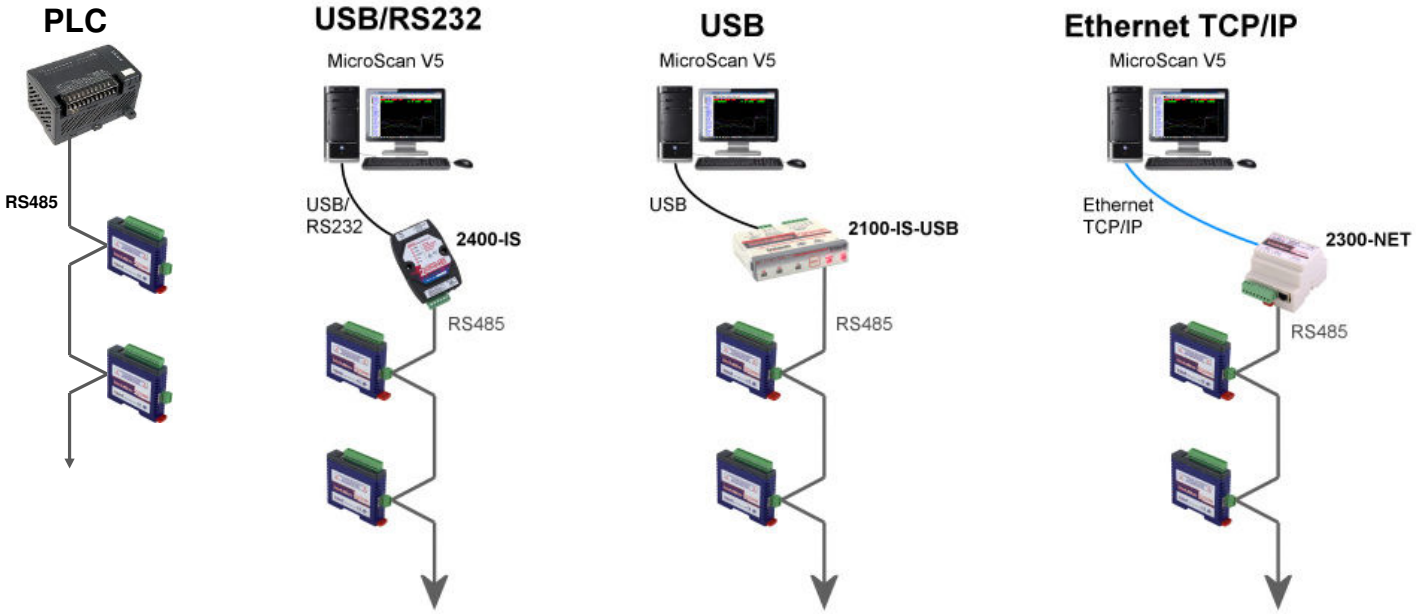
MODBUS supplementary manual to the 2300-MULTI Installation Guide.

The 2300 series stations are designed to connect as slaves to MODBUS RTU masters such as PC's or PLC's to offer an economical I/O solution.

Intech Micro 2300 Series I/O stations:

2300-A8II - 8 Isolated Current Inputs.
2300-A8VI - 8 Isolated Voltage Inputs.
2300-Tc8 - 8 Isolated Thermocouple Inputs.
2300-RTD6 - 6 RTD Inputs.
2300-MULTI - 2 RTD, 2 AI, 1 AO, 4 DI, 2 DO.
2300-D16 - 16 Digital Inputs.
2300-RO4 - 4 Relay Outputs.
2300-AO8I - 8 Current Outputs.
2300-NET - Isolated Ethernet TCP/IP to RS485.

Intech Micro 2300 Series - Connection Examples.



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2300-MULTI Specifications.

RTD Inputs:	-Input Points	2		-RTD Configuration	2 or 3 Wire
	-Resolution	0.1°C		-Drift	100ppm/°C Typ.
	-Line resistance effect	< 0.1°C balanced		-Max. line resistance	100ohms
	-Isolation	1500Vrms between field and logic			
RTD Type:	-Number	Type	Range	Accuracy	
	-1	Pt100	-200 to 850°C	± 0.3°CIEC 751:1983	
	-2	Ni120	-80 to 320°C	± 0.3°C	
	-3	Pt1000	-200 to 850°C	± 0.3°C	
	-4	Ni1000-DIN	-200 to 850°C	± 0.3°C	
	-5	Ni1000-Landys&Gyr	-200 to 850°C	± 0.3°C	
	-6	Ohms	10~400 ohms	± 0.05%	
	-7	Ohms	100~4000 ohms	± 0.05%	
Current Inputs:	-Input Points	2		-Input Current	0(4)~20 mA
	-Input Resistance	250ohms		-Drift	100ppm/°C
	-Input Type	Range	Resolution		
	-1	0 – 4095	12 bits		
	-2	4~20.000mA	1uA		
	-3	+/-20.000mA	1uA		
	-Accuracy	0.2% of span		-Isolation	1000Vrms between field and logic
Factory Option : Voltage Inputs:					
	-Input Voltage	0~1Vdc or 0~10Vdc		-Input Resistance	190kohms
	-Input Type	Range	Resolution		
	-4	0 – 4095	12 bits		
	-5	0 – 10.000 V	1mV		
	-6	+/- 10.000 V	1mV		
	-7	0 – 1.0000 V	0.1mV		
	-8	+/- 1.0000 V	0.1mV		
	-Drift	100ppm/°C		-Accuracy	0.2% of span
	-Isolation	1000Vrms between field and logic			
Current Output:	-Output Points	1		-Output Current	0(4)~20 mA
	-Output Type	Range	Resolution		
	-1	0 – 4095	12 bits		
	-Drift	100ppm/°C		-Accuracy	0.05% of span
	-Compliance	1000 ohms max. @ 24Vdc		500 ohms max. @ 12Vdc	
Factory Option : Voltage Output:					
	-Output Voltage	0(2)~10 V			
	-Output Type	Range	Resolution		
	-2	0 – 4095	12 bits		
	-Drift	100ppm/°C		-Accuracy	0.05% of span
	-Compliance	2000 ohms min. Load			
Digital Inputs:	-Input Points	4		-Input Voltage Range	10~26 Vdc
	-Input Current per input	4mA @ 12Vdc / 8mA @ 24Vdc			
Counters:	-Inputs	1 to 4		-Resolution	32 Bits
	-Frequency	50 Hz (max)		-Pulse Width	20 ms (min)
Digital Outputs:	-Output Points	2		-Maximum Voltage	36Vdc
	-Maximum Current	100 mA per output		-Vceon	1.1V Max.
Isolation:	-Between field and logic	1500Vrms between field and logic			
Connectors:	-Logic Power and Comms	4 Pin plug-in connector on side of station			
	-Inputs	18 Way screw plug-in connector on top of station			
Comms:	-Protocols	RS485, Modbus RTU			
	-Baud Rate	2400, 4800, 9600, 19200, 38400, 57600, 115200			
	-Format	Parity: 0 = none, 1 = even, 2 = odd Stop Bits: 1 = 1 stop bit, 2 = 2 stop bits			
Power Supply:	-Logic Supply Voltage	12~24Vdc			
	-Logic Supply Current	87mA @ 12V / 45mA @ 24V			
Safety and EMC Compliances:		EMC Compliance		89/336/EEC and Low Voltage Equipment Directive 73/23/EEC.	
		Safety Compliance		IEC 950.	
General Specifications: (Unless otherwise stated in other input specifications.)					
Operating Temperature		-10~50˚C.			
Storage Temperature		-40~85˚C.			
Operating Humidity		Up to 95% non condensing.			
Housing	-Dimensions	L=97.5, W=22.6, H=109mm.			
	-Mounting	35mm Symmetrical Mounting Rail.			

Note 1. Contact INTECH INSTRUMENTS for more detailed programming information.

Communications Settings.

The data in the station is stored in 16 bit registers. These registers are accessed over the network using the MODBUS RTU communication protocol.

Communications Settings with DIP Switch 10 OFF (IOStudio Mode)

BAUD RATE	9600
DATA BITS	8
PARITY	NONE
STOP BITS	1

Communications Settings with DIP Switch 10 ON (Programmed Baud Rate, MicroScan SCADA Factory Default)

BAUD RATE	2400, 4800, 9600, 19200, 38400, 57600, 115200
DATA BITS	8
PARITY	None, Even, Odd
STOP BITS	1, 2

Note: To change these settings, download the free **IOStudio 2300 Series MODBUS Configuration** software from the Intech website: **www.intech.co.nz** (Downloads > IOStudio 2300 Series).
During this mode, DIP Switch 10 should be turned OFF so that the PC can communicate with the 2300 station using the IOStudio Mode communications settings. Once the Communications Settings are programmed, power down the 2300 station and change DIP Switch 10 to the ON position. Restore the power to the 2300 station and the configured Communications Settings will be ready for use.
Warning: Only program ONE 2300 station at a time!

Communications Settings Registers.

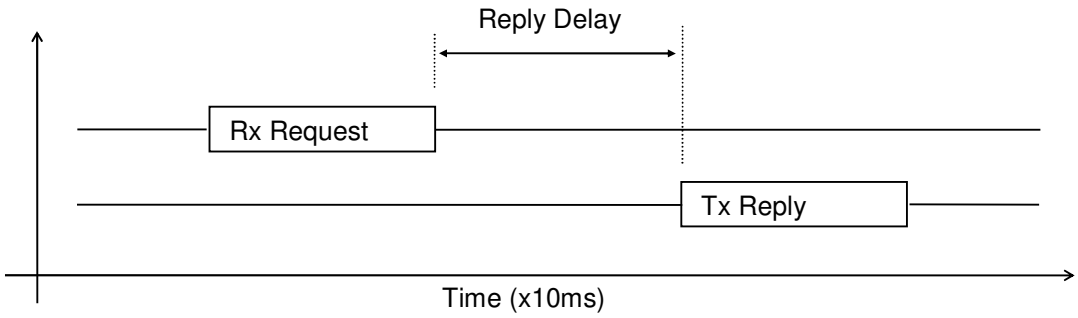
40121	Baud Rate	2400	11520	R/W	2400, 4800, 9600, 19200, 38400, 57600, 115200
40122	Parity	0	2	R/W	0 = none, 1 = even, 2 = odd
40123	Stop Bits	1	2	R/W	1 = 1 stop bit, 2 = 2 stop bits
40124	Reply Delay	0	65535	R/W	(x10ms)

Baud Rate Register (40121)
The baud rate value is programmed directly into the baud rate register. The only exception is the 115200 baud rate where the value 11520 is used.

Parity Register (40122)
The parity can be set to none by writing a 0 to the parity register, set to even by writing a 1 to the parity Register or set to odd by writing a 2 to the parity register.

Stop Bits Register (40123)
The number of stop bits can be set to 1 by writing a 1 to the stop bits register or set to 2 by writing a 2 to the stop bits Register.

Reply Delay Register (40124)
The reply delay is a time delay between the Modbus message received to the reply being sent. In some applications where a modem or radio is used in the RS485 network, it may be necessary to add a reply delay due to turn around delays in the equipment.



Modbus Register Types.

There are 4 types of variables which can be accessed from the station. Each station has one or more of these data variables.

Type	Start Address	Variable	Access	
1	00001	Digital Outputs	Read & Write	
2	10001	Digital Inputs	Read Only	
3	30001	Input registers (Analog)	Read Only	
4	40001	Output registers (Analog)	Read & Write	(Holding type)

Note: The Modbus message length must be limited to 100 consecutive read or write registers. If more registers are required then a new poll group must be added for the next xxx registers.

The 2300-MULTI station is a multipurpose combination of inputs and outputs. The station can accommodate either 2 or 3 wire RTD sensors, current (0~20mA) and voltage (0~10V) inputs, current (0~20mA) or voltage (0~10V) output, and digital inputs and outputs.

RTD INPUTS:

There are 2 RTD inputs on the station. The RTD resistance is read by the station circuitry, linearised and converted to degrees Centigrade. No ranging is required as the station covers the full range of the RTD as indicated in the RTD table. The value that is read from the Modbus register is the actual temperature in degrees centigrade to 0.1°C resolution. i.e.: a value of 3451 corresponds to a temperature of 345.1°C.

The RTD type is setup by writing a value to the RTD Type register. The value is obtained from the table below. For example to select a PT100 RTD, the value "1" must be written to the RTD Type register.
A value of -32767 is used to indicate downscale burnout.

Note: As there is no inter-channel isolation, isolated RTD's must be used in order to prevent ground loops and reading errors.

ANALOG INPUTS:

The Analog Inputs (2) can be configured by internal jumpers as either a current input (0~20mA) or a voltage input (0~10V). An input of 0~20mA input current or 0~10V input voltage represents an output value of 0 - 4095 (12 bits) in the corresponding Modbus register.

ANALOG OUTPUT:

There is a single analog output which can be configured with internal jumpers for a current output (0~20mA) or voltage output (0~10V). The resolution is 12 bits, so writing a value to the Modbus register for each output of 0 - 4095 would give an output current of 0~20mA. A value of 819 ± 1LSB will give a current output of 4mA.

DIGITAL INPUTS:

There are 4 digital inputs on the station. The inputs share a common terminal and can be configured for common positive or common negative. The inputs have got counters associated with them. The counters operate in three modes.

In **mode 0** all the counters are disabled.
In **mode 1** all counters are 32 bit counters allowing a count value from 0 to 4294967295. The count value can be cleared by writing a zero to the associated registers or preset to any other value using the same method.

In **mode 2** the inputs are connected as up/down counters. Input 1 will increment counter 1 while input 2 decrements counter 1.
Note: The count values are not battery backed-up and will be lost if power is turned off.

The format of the registers allows the status of the inputs to be read as either single bits or all at once as a single register on the Modbus network.

DIGITAL OUTPUTS:

The station has 2 open collector (NPN) digital outputs. The outputs may be used to drive lamps or external relays when more drive capability is required.

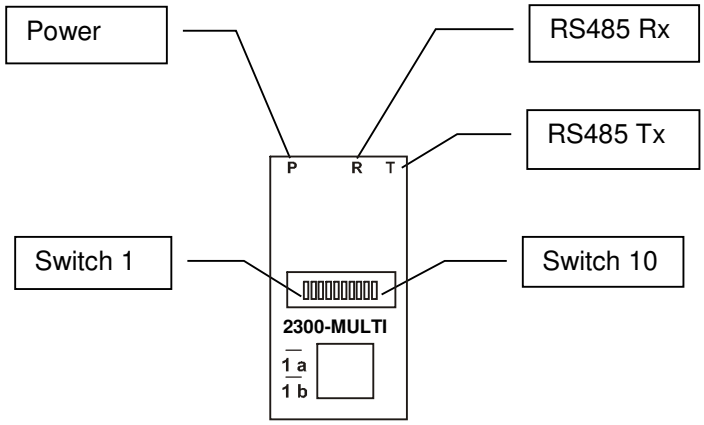
The outputs are written to by the Modbus master device such as a PC/ PLC/ HMI. Each output can be individually switched on or off, or all outputs can be set up at the same time by writing a single number to the output register which represents the status of all outputs.

An output watchdog timer can be configured to switch off all the outputs if there has been no communications with the station for up to 255 seconds. A value of 0 seconds will disable this timer and the outputs will remain in the last programmed state.

Status Indicators.

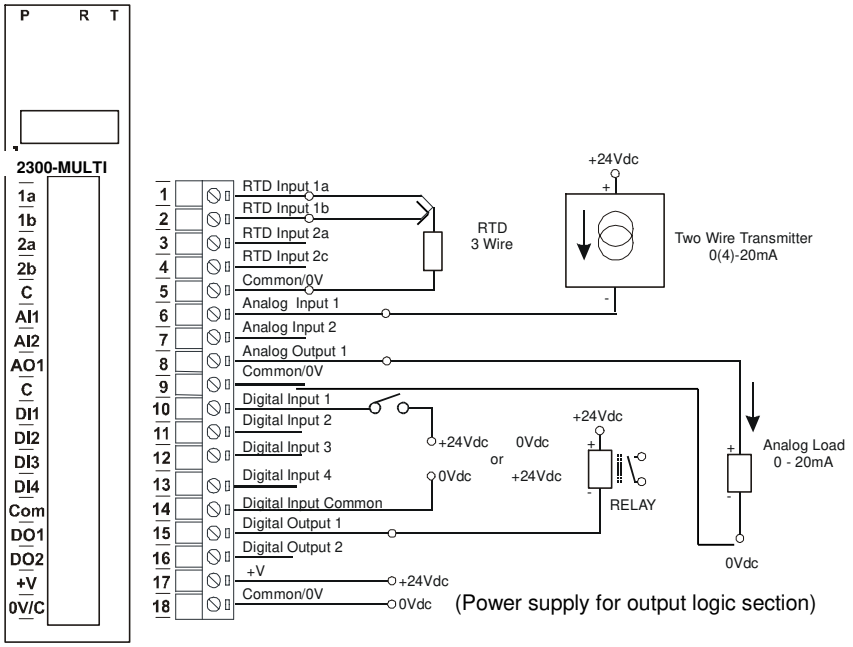
Power: "ON" when station has power.
RS485 Rx: Flashes to indicate the unit has received a valid Modbus message.
RS485 Tx: Flashes to indicate the unit has sent a Modbus message.

*** Please note that LED status is not available for Digital and Analog IO's for the 2300-MULTI**



Connection Example Diagram.

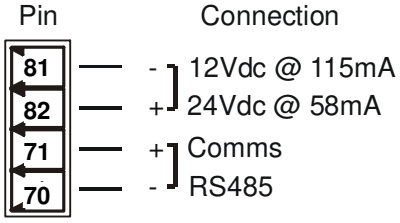
The following diagram shows how the inputs and outputs are connected to the 2300-MULTI station.



Notes:

1. Logic power input (terminals 17 & 18) range 12~24Vdc. The logic power supply input must be isolated and completely separate to the power supply that powers the 2300-MULTI on terminals 81 & 82. Failure to do so will cause the comms to stop.
2. Terminals 5, 9, 18 are internally connected and are common for AI, AO RTD and Logic power input. Terminal 14 DC (Digital Common) is isolated - refer to Note 5.
3. RTD, AI and DI inputs do not require the Logic power supply to be connected to terminals 17 & 18.
4. AO1 will only work if the Logic power supply is connected to terminals 17 & 18. AO will hold its last value until re-written too.
5. For DI operation, isolation is possible or for non isolated operation DC (terminal 14) can be connected to terminal 18 and used with the Logic power supply. For DO operation the Logic power supply is required and terminal 14 must be connected to terminal 18.
   If using DO and DI, isolation is not possible.

Power and RS485 Comms Wiring.



Warning: If the power/communication connections are reversed, the remote station may become faulty.

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Dip Switch Settings.

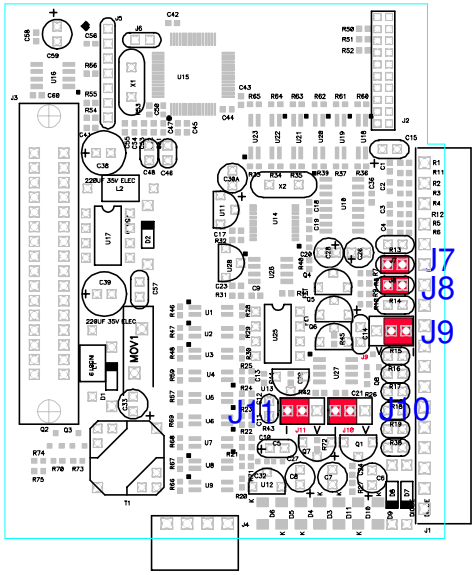
DIP SWITCH	FUNCTION	DESCRIPTION	
1	STATION ID	+1	Station ID's from 0 to 127 are set up using switches 1 to 7
2	STATION ID	+2	"
3	STATION ID	+4	"
4	STATION ID	+8	"
5	STATION ID	+16	"
6	STATION ID	+32	"
7	STATION ID	+64	"
8	-	Not used.	
9	-	Not used.	
10	BAUD RATE	Selects 9600 in OFF position (IOStudio Mode) or Programmed Baud Rate in ON position (MicroScan SCADA Factory Default) See Page 3 '*Communications Settings.*' for more information.	

Note: See Installation Guide for the *Station ID Table* (Dip Switch Settings).

Jumper Settings.

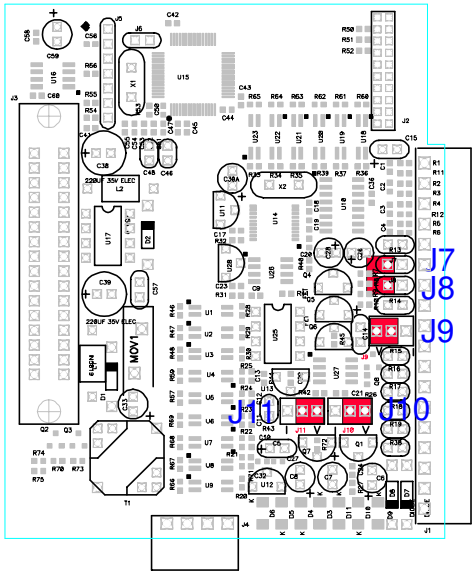
Current Input and Output
The Analog inputs can be configured as a current 0(4)~20mA input by placing the jumper on J7 for AI1 and J8 for AI2.

The Analog output can be configured as a current 0(4)~20mA output by placing the jumpers J9, J10 and J11 on the "I" position as shown below:



Voltage Input and Output
The Analog inputs can be configured as a voltage 0~10V input by removing the jumper from J7 for AI1 and J8 for AI2.

The Analog output can be configured as a voltage 0~10V output by placing the jumpers J9, J10 and J11 on the "V" position as shown below:



Data Registers.

Modbus Address	Register Name	Low Limit	High Limit	Access	Comments
10001	Digital Input 1	0	1	R	Status of Digital Inputs.
10002	Digital Input 2	0	1	R	"
10003	Digital Input 3	0	1	R	"
10004	Digital Input 4	0	1	R	"
00017	Digital Output 1	0	1	R/W	Status of Digital Outputs.
00018	Digital Output 2	0	1	R/W	"
30001	S/W Version / Module Type	N/A	N/A	R	High Byte = Software Version Low Byte = 112
30002	Digital Inputs	N/A	N/A	R	Digital Inputs in lower 8 bits. 8 - 1.
40003	Digital Outputs	N/A	N/A	R/W	Digital Outputs in lower 8 bits. 8 - 1.
40004	RTD Input 1	-xxx.x	yyyy.y	R	RTD Inputs. See table for range.
40005	RTD Input 2	-xxx.x	yyyy.y	R	Resolution in 0.1°C.
40006	Analog Input 1	0	4095	R	Analog Input lower 12 Bits
40007	Analog Input 2	0	4095	R	Analog Input lower 12 Bits
40008	Analog Output 1	0	4095	R/W	Analog Output lower 12 Bits
40009	Counter 1 MSB	0	65535	R/W	Counter MSB and LSB combine to give a 32 bit
40010	Counter 1 LSB	0	65535	R/W	Counter with range 0 to 4294967295.
40011	Counter 2 MSB	0	65535	R/W	"
40012	Counter 2 LSB	0	65535	R/W	"
40013	Counter 3 MSB	0	65535	R/W	"
40014	Counter 3 LSB	0	65535	R/W	"
40015	Counter 4 MSB	0	65535	R/W	"
40016	Counter 4 LSB	0	65535	R/W	"
30100	DIP Switch	0	65535	R	Status of DIP Switch on Front Panel
40101	Watchdog Timer	0	255	R/W	Timer in seconds. 0 = disabled. 1 - 255 = enabled.
40102	Counter Mode	0	2	R/W	0=Disable, 1=Up Counting, 2=Up/Down Count
40103	Input Filter	0	65535	R/W	0 = Disable, >0 = Enable. (x10ms)
40104	RTD 1 Type	1	7	R/W	See RTD Tables.
40105	RTD 2 Type	1	7	R/W	See RTD Tables.
40106	AI 1 Type	1	2	R/W	1 = 0~20mA, 2 = 0~10V
40107	AI 2 Type	1	2	R/W	"
40108	AO Type	1	2	R/W	"
40109	Line Frequency	50	60	R/W	Line Frequency
40110	Units Type	1	2	R/W	1=°C, 2=°F
40121	Baud Rate	2400	11520	R/W	2400, 4800, 9600, 19200, 38400, 57600, 115200
40122	Parity	0	2	R/W	0 = none, 1 = even, 2 = odd
40123	Stop Bits	1	2	R/W	1 = 1 stop bit, 2 = 2 stop bits
40124	Reply Delay	0	65535	R/W	0 = Disable, >0 = Enable. (x10ms)

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