Communication protocol description of **Optimus Drive AI** series

single-loop measurement and control instrument

(Version 9.1)

Optimus Drive V9.X and above single-loop measurement and control instruments can support two communication protocols, AIBUS and MODBUS . Among them, AIBUS can realize comprehensive functions with simple instructions. Its characteristic is to write parameters At the same time, the reading function can also be completed, so the cycle time of reading will not be destroyed when writing parameters, and it is allowed to connect up to 80 instruments on one RS485 communication interface . The general-purpose MODBUS protocol has wider compatibility. The MODBUS protocol read command of V9.X or above can read up to 20 characters of data at a time, and its communication efficiency is greatly improved compared with the previous version of our company. The average time for the host computer to access a V9.X version of the V9.X version of the new generation of AI series meters is only 20About mS , when the data transmission time is not considered, the maximum delay time of the instrument after receiving the command from the host computer is only 10mS , and the average delay time is only 2~3mS , which is much faster than the previous version of the company, and can easily build a large-scale process control system. All V9.X versions of the new generation of AI instruments allow the host computer to write more than 2 billion times, ensuring that the internal memory of the instrument will not be damaged due to frequent writing by the host computer , and the host computer can be used to form a complex adjustment system for the instrument. AI series instruments can use PC , touch screen and PLC as the upper computer, and various configuration software resources are abundant in the market. The upper computer software based on PC widely adopts WINDOWS as the operating environment, which is not only intuitive and convenient to operate, but also powerful. The application of the latest industrial flat panel touch screen brings easy-to-use, rich-featured and cheap-priced options to industrial automation . This makes the price of the measurement and control system using the instrument + host computer structure much lower than the traditional DCS system, Its distributed structure also has high reliability . Except for some newly launched models, the V9.XX version communication protocol is fully compatible with the company's V8.XX communication protocol while improving performance and functions. The customer's original host computer software can be used directly without modification.

Compared with the previous V9.0X version, the latest V9.1 version adds functions such as even parity mode, S6/S7 communication module address compatibility mode, and parameter writing restrictions. The parameter writing restriction function allows specific or all instrument parameters to be modified only when Loc is set to a specific value, which can reduce the situation where the instrument works abnormally due to communication software programming errors. The new communication protocol also supports the use of EP parameters to customize the parameters that allow continuous address reading and writing, which allows users to arbitrarily select up to 8 commonly used parameters to read in batches, thus greatly improving the operational flexibility.

1. Interface specifications

AI series instruments use asynchronous serial communication interface, and the interface level complies with the provisions of RS232C or RS485 standard. The data format is 1 start bit, 8 data bits, no parity bit or even parity bit , 1 or 2 stop bits. The baud rate of communication transmission data can be adjusted to 48 00~ 288 00 bps , usually 9600 bps , if you need a faster refresh rate, you can also try to use 19200 or 28800 bps , when the communication distance is very long or the communication is unreliable and often interrupted, Optional 4800 bps .

The communication distance of the RS485 communication interface is more than 1KM (some practical applications have reached 3-4KM), and only two wires are needed to enable multiple AI instruments to communicate with the computer. Ordinary computers can use RS232/RS485 or USB/RS485 communication interface converters to convert the RS232 communication port or USB port on the computer into an RS485 communication port. Optimus Drive RS232/RS485 and USB/RS485 converters have the advantages of small size, adaptability to any software without initialization, no need for external power supply, and certain lightning resistance. According to the regulations of the RS485 interface, the RS485 communication interface can connect up to 32 instruments or computers on one communication line. When more instruments need to be connected, a repeater is required, and the communication interface of chips such as 1/2 or 1/4 load can also be selected to increase the number of connected instruments. The current AI instrument communication interface uses low-load chips and has certain lightning protection and anti-static functions. It can connect about 60 instruments without repeaters .

The RS232 and RS485 communication interfaces of the AI instrument use photoelectric isolation technology to isolate the communication interface from other parts of the instrument. When a certain instrument on the communication line is damaged or malfunctions, it will not affect other instruments. Similarly, when the communication part of the instrument is damaged or the host fails, the instrument can still perform measurement and control normally, and the instrument can be operated through the instrument keyboard, and the work reliability is very high. When there are other companies on the same network that also use master-slave communication products, such as PLCs , inverters, etc. , it should be noted that the AI BUS protocol does not guarantee that the products of other companies can work normally . Generally, AI instruments should not be mixed with other products. One RS485 communication bus, but should use different communication lines , or adopt MODBUS protocol .

Optimus Drive V9.x version smart meter adopts AFC parameter selection protocol type, AFC=AFC.A+AFC.D*8 . The functions are as follows

AFC parameter value	Function Description	AFC parameter value	Function Description
0	Standard MODBUS-RTU protocol, no checksum	8	Standard MODBUS-RTU protocol, even parity
1	AIBUS protocol, no checksum	9	AIBUS protocol, even parity
2	Compatible MODBUS-RTU protocol, no checksum	10	Compatible MODBUS-RTU protocol, even parity
4	Standard MODBUS-RTU protocol	12	Standard MODBUS-RTU protocol

	S6/S7 address compatibility mode, no checksum		S6/S7 address compatibility mode, even parity

2. AIBUS protocol communication instruction description

This article uses the hexadecimal data format to represent various instruction codes and data. There are only two communication commands of the AI BUS, one is a read command, and the other is a write command. The length of the sent byte of the command is 8 bytes, and the length of the received byte is 10 bytes, which makes the host computer software write Easy, but still able to complete various operations on the instrument, the command must be sent continuously, if the byte length is wrong, the instrument will not respond.

Instrument address: The address range of AIBUS protocol is 0~80, a communication line can connect up to 81 AI instruments, and the communication address of the instrument is determined by the parameter Addr. The instrument uses two repeated values between 128~208 (80H~D0H in hexadecimal) to represent the address code, because the two consecutive numbers of 128~208 usually do not appear in the AI instrument, so the data and address are different. will repeatedly cause conflicts. The AI instrument communication protocol stipulates that the address command is two identical bytes, and the value is (instrument address + 80H). For example: instrument parameter Addr=10 (hexadecimal number is 0AH, 0A+80H=8AH), then the address command of the instrument is:

8AH 8AH

Parameter address: The parameters of the instrument are represented by a parameter address code of an 8-bit binary number (one byte). It indicates the name of the parameter to be read / written in the command, and the meaning of various parameters is shown in the following table.

Check code: The check code adopts the 16-bit sum check method, and the check code calculation method of the read command is:

The code of the parameter to be read × 256+82 (52H) +A ddr

The check code calculation method of the write command is the remainder calculated by the 16-bit binary addition of the following formula (the overflow part is not processed):

Parameter code to be written × 256+ 67(43H) + parameter value to be written +A ddr

Return data: Whether it is reading or writing, the instrument will return 10 bytes of data, of which PV, SV and the read parameter value each occupy 2 bytes, representing a 16-bit binary signed complement integer, and the low byte is in the The high-order byte is in the front, and the integer cannot represent the decimal point, so the user is required to process it in the host computer; MV occupies one byte, according to the 8-bit signed binary number format, the value range is -110~+110, and the status bit occupies one byte. The check code occupies 2 bytes, a total of 10 bytes. The check code is PV+SV+ (alarm status *256+MV) + parameter value + A ddr is the remainder obtained by adding 16-bit integers, and the overflow number is ignored.

The specific interactive commands are as follows:

Read parameter command:

address code LSB	address code MSB	read function command	Read parameter code	LSB	MSB	checksum LSB	checksum MSB
80H+ Instrument address	80H+ Instrument address	52h	See parameter code list	00H (fixed value)	00H (fixed value)	See note 1	

Note 1 : checksum = read parameter code * 256 (100H) + 82 (52H) + instrument address

For example , the command to read the upper limit alarm value of instrument address 1 is as follows:

address code LSB	address code MSB	read function command	Read parameter code	LSB	MSB	checksum LSB	checksum MSB
81H	81H	52h	01H	00H	00H	53h	01H

Checksum =1(01H)*256(100H)+1(01H)+82(52H) = 339(153H) , because the low byte (LSB) is in front and the high byte (MSB) is in the back, so the 53H , 01H in the table .

Write parameter command

address code LSB	address code MSB	write function command	Write parameter code	write value LSB	write value MSB	checksum LSB	checksum MSB
80H+ Instrument address	80H+ Instrument address	43h	See parameter code list	See note 1		See note 2	

Note 1 : For the data to be written into the instrument, the low byte comes first and the high byte follows.

Note 2 : checksum = (write parameter code * 256 (100H) + 67 (43H) + instrument address + write value) & FFFFH to get the remainder

For example, the command to write the given value of instrument address 1 to 100.0 is as follows:

address code LSB	address code MSB	write function command	Write parameter code	write value LSB	write value MSB	checksum LSB	checksum MSB
81H	81H	43h	00H	E8H	03H	2CH	04H

Checksum =0(00H)*256(100H)+1(01H)+1000(03E8H)+67(43H) = 1068(42CH) , because the low byte (LSB) comes first , the high byte (MSB) After that, it is 2CH , 04H in the above table .

Return data: Whether it is a read command or a write command, the instrument returns 10 bytes of data

Measurements LSB	Measurements MSB	set value LSB	set value MSB	output value MV	status byte	Read or write parameter value LSB	Read or write the MSB of the parameter value	checksum LSB	checksum LSB
Note 1								Note 2	

Note 1: Measured value = (measured value MSB*256) + measured value LSB

The set value and the read or write parameter value analysis method are the same

Note 2. Check sum = (measured value + set value + status byte * 256 + output value MV + read or written parameter value + instrument address) & FFFFH, when the communication data is disturbed, it can be The checksum in the return value is compared with the calculated checksum. If the two are the same, the data is normal. Otherwise, an exception may be caused by interference.

Assume that the measured value on the meter at address 1 shows 100.0, the set value shows 0.0, no alarm occurs, no output, and the command returned by reading or writing the set value to 0.0 is as follows:

Measurements LSB	Measurements MSB	set value LSB	set value MSB	output value MV	status byte	Read or write parameter value LSB	Read or write the MSB of the parameter value	checksum LSB	checksum LSB
E8H	03H	00H	00H	00H	60H	00H	00H	E9H	63h

The status byte indicates the status of instrument alarm and alarm relay, and its meaning is as follows (bit 7 is fixed as 0):

status byte	meaning
bit 0	Upper limit alarm (HIAL) 0: no alarm 1: Alarm generation
bit 1	Lower Limit Alarm (LoAL) 0: no alarm 1: Alarm generation
bit 2	Positive Deviation Alarm (dHAL) 0: no alarm 1: Alarm generation
bit 3	Negative Deviation Alarm (dLAL) 0: no alarm 1: Alarm generation
bit 4	Input over-range alarm (orAL) 0: no alarm 1: Alarm generation
bit 5	AL1 state, 0 is action
bit 6	AL2 state, 0 is action

3. Description of MODBUS - RTU communication protocol instructions

AI series instruments can support two commands of 03H (reading parameters and data) and 06H (writing a single parameter) under the MODBUS protocol. It can communicate with other MODBUS devices. In order to ensure the speed, the AI meter adopts RTU (binary) mode, the baud rate should be set to 9600 bps, 2 stop bits, no parity bit, and the address range of the meter is 0~80.

For the 03 H command, 1~20 data can be read each time, and each data is 2 bytes. For example, the command to read 2 data is as follows:

Instrument address	Read command (function code)	Read parameter code address	read data length	check code
XXH	03H	00H XXH	00H 02H	CRC

06H write command format is, for example, write SV value 100.0 (parameter dPt=1), then the sent command is:

Instrument address	Write command (function code)	Write parameter code address	write data value	check code
XXH	06H	00H 00H	03H E8H	CRC

The data format returned by the instrument complies with the standard MODBUS protocol, and usually the user's configuration software can handle it by itself. Note that the write command does not support returning information such as measured values, but only returns the parameter value written by itself. Due to the limitation of the MODBUS protocol itself, the measured value and other information cannot be returned by using the write command, which will cause the measured value to not be refreshed when writing. When it is necessary to continuously write parameters, the method of writing once and reading alternately should be adopted to avoid that the measured value and other information cannot be refreshed in time during continuous writing. In addition, if there is a BUG in the program, if the communication write command is called by mistake, it may cause wrong parameters to be written into the instrument. Therefore, the use of write commands should be minimized in the program to avoid abnormal operation of the instrument.

3. If you need to read a large amount of data more efficiently, you can use the company's Modbus-AIBUS communication relay control and protocol converter, or use the S6 enhanced communication module with its own CPU. For details, please refer to the use of related products manual.

4. Parameter code (register) address and meaning (AIBUS and MODBU-RTU protocols are the same)

AI series single-loop artificial intelligence control instrument readable / writable parameter code table (for S6 compatibility mode, please refer to the S6 module manual)

(AI-8 series /AI-6 series /AI-516/516P/526/526P / 519/716/716P/ 719/719P)

parameter code	parameter name	illustrate
00H	SP1 given value	The unit is the same as the measured value
01H	HIAL upper limit alarm	The unit is the same as the measured value
02H	LoAL lower limit alarm	The unit is the same as the measured value
03H	dHAL positive deviation alarm	The unit is the same as the measured value
04H	dLAL negative deviation alarm	The unit is the same as the measured value
05H	AHYS alarm hysteresis	The unit is the same as the measured value
06H	CtrL control mode	0, ONOFF; 1, APID; 2, nPID; 3, PoP; 4, SoP
07h	P proportional band	The unit is the same as the measured value
08H	I integration time	second
09H	d Differential time	0.1 seconds
0AH	CtI control cycle	0.1 seconds
0BH	InP input specification	see instruction manual
0CH	dPt decimal point position	0, 0; 1, 0.0; 2, 0.00, 3, 0.000; if the above data read in +128, it means that all measured values and parameters using the same unit as the measured values (whether it is temperature or linear signal) need After division by 10, round up to 5 and then perform display processing. For example, the value of dPt is 128+1=129, and the 16-bit integer value of the read-in measured value or related parameter value is 1000, the actual display should be 10.0, if the value of dPt is 1, the actual displayed data is 100.0; this parameter It can also be written, but 128 cannot be added when writing, and the writing data range is 0~3.
0DH	ScL scale lower limit	The unit is the same as the measured value
0EH	ScH scale upper limit	The unit is the same as the measured value

0FH	ALP alarm output selection	See the manual for the meaning
10H	Sc measurement translation correction	The unit is the same as the measured value
11H	o P1 main output mode	0, SSR; 1, rELy; 2, 0-20; 3, 4-20
12H	OPL output lower limit	%
13H	O PH output upper limit	%
14H	CF function selection	See the manual for the meaning
15H	Characteristic word of instrument model	For the meaning, see the meter model and feature word table
16H	Addr mailing address	
17H	FILt digital filtering	
18H**	AMAn manual / automatic selection	0 , MAN ; 1 , Auto ; 2 , FMan ; 3 , FAut
19H	Loc parameter blockade	
1AH**	MV manual output value	
1BH	Srun run / stop selection	0, run; 1, StoP; 2, HoLd
1CH	CHYS control hysteresis	The unit is the same as the measured value
1DH	At self-tuning selection	0, OFF; 1, on; 2; FoFF
1EH	SPL given value lower limit	The unit is the same as the measured value
1FH	SPH set value upper limit	The unit is the same as the measured value
20H	Fru unit and power frequency	0, 50C; 1, 50F; 2, 60C; 3, 60F
21H	OHEF OPH effective range	The unit is the same as the measured value
22h	Act Positive / Reverse Effect	0, rE; 1, dr; 2, rEbA; 3, drbA
23h	AdIS alarm selection	0, OFF; 1, on

24H	Aut cold output specifications	0, SSR; 1, rELy; 2, 0-20; 3, 4-20
25h	P2 cold output proportional band	The unit is the same as the measured value
26h	I2 cold output integration time	second
27h	d2 cold output differential time	0.1 seconds
28h	CtI2 cold output cycle	0.1 seconds
29h	Et event input type	0, nonE; 1, ruSt; 2, SP1.2; 3, PId2
2AH ***	SPr heating rate limit	Measurement value unit / (minute) (need to be equal to the measurement value for unit processing)
2BH*	Number of Pno blocks	integer
2CH*	PonP power-on selection	0, Cont; 1, StoP; 2, run1; 3, dASt; 4, HoLd
2DH*	PAF program parameters	See the manual for the function
2EH*	STEP block number	integer
2FH*	elapsed time	0.1 minutes or 0.1 hours, determined by PAF parameters
30H*	Event output status	0, no event output; 1, event 1 (AL1) action; 2, AL2 action; 3, AL1 and AL2 action
31H**	OPrt soft start time	
32H**	Strt valve rotation time	Defines the time required for the valve to turn
33H **	Given lower limit outside SPSL	When the external given input port is used to measure the valve feedback signal, set the valve positioning value to 1
34H **	Given upper limit outside SPSH	When the external given input port is used to measure the valve feedback signal, set the valve positioning value to 2
35H**	Ero fault output value	Define the adjusted output value of the instrument when the sensor input fails or exceeds the range
36H**	AF2	Function parameter 2
37h	now	AU1/AU2/AL1/AL2 and other alarm output normally open normally closed selection The cascade control instrument is the Cc parameter
38 ~ 3FH	spare	
40~47H	Field parameters EP1~EP8	Users can customize 0~8 parameters that need to be read and written
48H**	Valve position (read only)	The value 0~25600 corresponds to 0~100%, the reading number divided by 256 is the percentage number
4 9 H ****	Cascade secondary control input	Some models of meters are the second measured value

4AH	Measured value (PV)	The data is a 2 -byte integer, and the position of the decimal point is determined by the dPt parameter, (read-only)
4 BH	Set value (SV)	Actual given value, external given, (read only)
4C HOUSE	output value (MV) + alarm status	The low byte is the MV output percentage, and the high byte is the alarm status
4DH	Output port status + working status	BIT0~1 : stands for running / stop / paused state; BIT2 : 1 stands for auto-tuning start; BIT3 ; 1 stands for manual state; BIT4~7 , standby; BIT8~1 2 stands for output port state respectively: OP1/OP2/ AU1/AU2 /MIO , 0 means action, 1 means no action; BIT1 3 ~15 , spare , see instruction 8 (read only)
4EH _	spare	Some models are used to read the measured temperature of the instrument's internal thermal couple cold junction compensation (read only)
4FH****	Cascade auxiliary control output	16BIT data format, non-cascaded instrument is 16BIT main control output value
50~51H	SP 1、t 1	SP1 is given value 1 , t1 is the first program value
52H~	SP2 ~ block data, the number is defined by the Pno parameter	

illustrate:

1. The system adopts a master-slave multi-machine communication structure, and each time an instruction is sent to the instrument, the instrument returns a piece of data. When writing the host computer software, pay attention to each valid instruction and the instrument should respond within 0~10mS (note: data transmission time is not included, this time should be calculated according to different baud rates and data lengths) , and the host computer must also wait for the instrument to respond . After the data is returned, a new command can be issued, otherwise an error will be caused. If the instrument does not reply after the maximum response time, the reasons may be invalid command, invalid instrument address or parameter address, communication line failure, instrument not powered on, communication address mismatch, etc. At this time, the host computer should resend the command or skip changing the address meter.

2. To improve efficiency, all values transmitted by the instrument are 16 - bit two-complement integers. For example, the set value of the instrument is 100.0 ℃ , and the transmitted data is an integer of 1000 . The upper computer must convert the integer into actual data with a decimal point according to certain rules. The method is that after the upper computer program is started, the parameter dPt (0CH) should be read first to obtain the decimal point position of the measurement signal. Note: If the value of dPt is greater than or equal to 128 , it means that the transmitted measurement value and the parameters with the same unit as the measurement value should be divided by 10 and displayed. When writing such parameter values to the lower computer, it should be displayed Cancel the decimal point to make the number into an integer, multiply it by 10 , and download the data in 16 -bit two's complement code.

3. If you read a parameter whose parameter code is not in the table (invalid parameter code or spare parameter code) to the meter, the parameter value 32767. Since the maximum setting range

of AI series meter parameters is 32000 , 3 2767 can be used as a read The sign of the wrong parameter code is processed in the upper computer program; if the read parameter code is greater than the last value (0B4H) of the valid program segment, the lower computer regards the transmission as an error and does not respond. In addition, some models of instruments only have some parameters in the table. For example , the parameters with an asterisk are only available for models such as AI-51 6 P / 526 P/719P . If you read and write AI-51 6 / 526 / 719 , it is regarded as Invalid parameter code, the parameters marked with ** can only be used by instruments such as AI-719 . The readable and writable parameters of various instruments will change with the launch of new models and version upgrades. Customers can consult our technical department if necessary .

4. If you write to the instrument a parameter whose parameter code is not in the table, or the instrument of this model does not have this parameter, the instrument will not report an error, but will ignore it and will not execute the write, and return the parameter value 32767 . If the written value exceeds the internal value range of the instrument, for example, the set output value exceeds the output upper limit value allowed by the system, the instrument will write the upper limit value and return the upper limit value at the same time.

5. When the instrument with manual adjustment function is in the manual state, the manual output value can be adjusted by writing 1AH parameters.

6. The application of instruments with communication functions and MODBUS protocol is becoming more and more widespread. In order to avoid the host computer program from wrongly writing important parameters of the instrument and optimize the performance of the MODBUS protocol, since version V9.1 , the instrument has added a communication write parameter limit function, and the instrument Read and write also allows customers to customize commonly used field parameters. The on-site parameter definition function can make the commonly used parameters be arranged continuously, which is convenient for the MODBUS protocol to read multiple on-site parameters that customers are interested in at the same time with one command, which greatly improves the communication efficiency of MODBUS , and at the same time avoids mistakenly writing parameters other than the on-site parameters. The write restriction permission is controlled by the Loc parameter of the instrument, and the rules are as follows:

Loc=0~63 , allowing to write all parameters, compatible with the communication rules of the company's previous version of the instrument, and adding the function of reading and writing field parameters;

Loc=128~191 (recommended setting), the instrument terminal operation limit corresponds to Loc=0~63 , and the communication terminal only allows writing 4 alarm parameters such as SV , program segment, HIAL~dHAL , Srun operation / stop control parameters and EP1~ The on-site parameters defined by EP8 are set by the instrument panel, and 0~8 parameters that need to be read and written by the communication terminal can be selected in the instrument parameter table, and other parameters are prohibited from being written;

Loc=192~255 , all parameters are prohibited to be written, the communication only runs to read the instrument data, and the operation limit of the instrument terminal corresponds to Loc=0~63 .

7. 15H is the model characteristic word of the meter. Different models of meters have different numbers. The upper computer can be used to distinguish the model of the meter , and the upper computer can process the transmitted data in different modes for different types of meters . The instrument model and characteristic word table are as follows :

Instrument model	model character
AI- 8X8 series artificial intelligence regulator / thermostat	8080
AI- 8X9 series cascaded artificial intelligence regulator / thermostat	8090
AI- 6X8 series artificial intelligence regulator / thermostat	6080
AI - 6X1 series single loop measurement display alarm instrument	6210
AI- 500 single-loop general-purpose measuring instrument	5010
AI -501 single-loop general-purpose measuring instrument	5010
AI-51 6 Intelligent Thermostat	51 6 0
AI-51 6 P Programmable Intelligent Thermostat	51 6 7
AI-5 26 Smart Thermostat	5 26 0
AI-5 26 P Programmable Intelligent Thermostat	5 26 7
AI-518 Smart Thermostat	5180
AI-518P program type intelligent thermostat	5187
AI- 700 single-loop general-purpose measuring instrument	7010
AI -701 single-loop universal measuring instrument	7010
AI- 7 1 6 high precision intelligent thermostat	7 1 6 0
AI- 7 1 6 P high-precision programmable intelligent thermostat	7 1 6 7
AI-708 high precision intelligent temperature controller	7080
AI-708P High Precision Programmable Intelligent Thermostat	7087
AI-719 High Precision Intelligent Thermostat / Regulator	7190
AI-719P High Precision Programmable Intelligent Thermostat / Regulator	7197

8. Description of output port status and working status register 4DH :

Bit arrangement	status description
bit 0	00 : The meter is running
bit 1	01 : The meter is in the stop state 02 : The instrument is in a paused state
bit 2	0 : no action 1 : The meter self-tuning AT is turned on, and this bit is automatically reset to 0 after the tuning is completed

bit 3	0：automatic operation state 1：Manual operation state, only the instrument that supports manual automatic switching is meaningful, otherwise it is 0 automatic state
bit 4	alternate, default is 0
bit 5	
bit 6	
bit 7	
bit 8	0：OP1 port ON 1：OP1 port OFF
bit 9	0：OP2 port ON 1：OP2 port OFF
bit 10	0：AU1 port ON 1：AU1 port OFF
bit 11	0：AU2 port ON 1：AU2 port OFF
bit 12	0：MIO port ON 1：MIO port OFF
bit 13	alternate, default is 0
bit 14	
bit 15	

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