

# User Manual for communication

Displacement Sensor

## **BD Series**

MSO-BDC1-V1.0-2001US

Thank you for purchasing an Autonics product.  
This user manual contains information about the product and its proper use,  
and should be kept in a place where it will be easy to access.



# Preface

Thank you for purchasing Autonics product.





Please familiarize yourself with the information contained in the **Safety Considerations** section before using this product.

This user manual contains information about the product and its proper use, and should be kept in a place where it will be easy to access.

# User Manual Guide


- Please familiarize yourself with the information in this manual before using the product.
- This manual provides detailed information on the product's features. It does not offer any guarantee concerning matters beyond the scope of this manual.
- This manual may not be edited or reproduced in either part or whole without permission.
- This manual is not provided as part of the product package. Please visit our website ([www.autonics.com](http://www.autonics.com)) to download a copy.
- The manual's content may vary depending on changes to the product's software and other unforeseen developments within Autonics, and is subject to change without prior notice. Upgrade notice is provided through our homepage.
- We contrived to describe this manual more easily and correctly. However, if there are any corrections or questions, please notify us these on our website.


# User Manual Symbols

Symbol	Description
 <b>Note</b>	Supplementary information for a particular feature.
 <b>Warning</b>	Failure to follow instructions can result in serious injury or death.
 <b>Caution</b>	Failure to follow instructions can lead to a minor injury or product damage.
 <b>Ex.</b>	An example of the concerned feature's use.
※	Annotation mark.

# Safety Considerations

- Following these safety considerations will ensure the safe and proper use of the product and help prevent accidents, as well as minimizing possible hazards.
- Safety considerations are categorized as Warnings and Cautions, as defined below:

 <b>Warning</b>	<b>Warning</b>	Failure to follow the instructions may lead to a serious injury or accident.
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 <b>Caution</b>	<b>Caution</b>	Failure to follow the instructions may lead to a minor injury or accident.
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## Warning

- Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss. (e.g. nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime/disaster prevention devices, etc.)  
Failure to follow this instruction may result in personal injury, economic loss or fire.
- Do not use the unit in the place where flammable/explosive/corrosive gas, high humidity, direct sunlight, radiant heat, vibration, impact, or salinity may be present.  
Failure to follow this instruction may result in explosion or fire.
- Do not disassemble or modify the unit.  
Failure to follow this instruction may result in fire.
- Do not connect, repair, or inspect the unit while connected to a power source.  
Failure to follow this instruction may result in fire.
- Check 'Connections' before wiring. [Amplifier unit]  
Failure to follow this instruction may result in fire.

## Caution

- Do not stare at the laser emitter. [Sensor head]  
Failure to follow this instruction may result in eye damage.
- Use the unit within the rated specifications.  
Failure to follow this instruction may result in fire or product damage.
- Use dry cloth to clean the unit, and do not use water or organic solvent.  
Failure to follow this instruction may result in fire.
- Mount the ferrite core to specified position before using. [Sensor head, Extension cable]  
Failure to follow this instruction may result in output with noise.

## Cautions during Use

- Follow instructions in 'Cautions during Use'. Otherwise, it may cause unexpected accidents.
- The power supply should be insulated and limited voltage/current or Class 2, SELV power supply device.
- Do not install where strong magnetic or electric field exist. Otherwise, the resolution may be adversely affected.
- Mutual optical interference between laser sensors and photoelectric sensors may result in malfunction.
- Mutual optical interference between laser sensors may result in malfunction.
- When connecting DC relay or other inductive load to the output, remove surge by using diode or varistor.
- Wire as short as possible and keep away from high voltage lines or power lines, to prevent surge and inductive noise. [ Amplifier unit]
- For the optimized performance, it is recommended to measure after 30 minute from supplying power. [Amplifier unit]
- Since external disturbance light (sunlight, fluorescent lighting, etc.) can cause product malfunction, use the product with a light shield or slit. [Sensor head]
- When detecting with the maximum sensitivity, an error may occur depending on each characteristic deviation.
- This unit may be used in the following environments.
  - ① Indoors/Outdoors (in the environment condition rated in 'Specifications')
  - ② Altitude max. 2,000m
  - ③ Pollution degree 2
  - ④ Installation category II

The specifications are subject to change and some models may be discontinued without notice.

Be sure to follow cautions written in the instruction manual, user manual and the technical descriptions (catalog, website).

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# 1 Communication Overview

## 1.1 Modbus

The Modbus industrial protocol was developed in 1979 to make communication possible between automation devices. The protocol has expanded to include implementations over serial, TCP/IP, and the user datagram protocol (UDP). Today, it is a common protocol used by countless devices for simple, reliable, and efficient communication across a variety of modern networks.

- ※ Refer to the reference document of developer for the details
- ※ Communication of BD-C series is based on Modbus RTU.

## 1.2 Frame Structure of Modbus RTU

### 1.2.1 Read Coil Status (Func 01-01H)

Read output (OX reference, Coil) ON/OFF status in the slave device.

#### ▪ Query (Master)

Slave Address	Function	Starting Address		No. of Points		Error Check (CRC16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

← CRC16 →

#### ▪ Response (Slave)

Slave Address	Function	Byte Count	Data	Data	Data	Error Check (CRC16)	
						Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

← CRC16 →

### 1.2.2 Read Input Status (Func 02–02H)

Read Input ON/OFF status (1X reference) in Slave device.

▪ **Query (Master)**

Slave Address	Function	Starting Address		No. of Points		Error Check (CRC16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

CRC16

▪ **Response (Slave)**

Slave Address	Function	Byte Count	Data		Data		Error Check (CRC16)	
			High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	

CRC16

### 1.2.3 Read Holding Register (Func 03–03H)

Read the Binary data of Holding Registers (4X reference) in Slave device.

▪ **Query (Master)**

Slave Address	Function	Starting Address		No. of Points		Error Check (CRC16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

CRC16

▪ **Response (Slave)**

Slave Address	Function	Byte Count	Data		Data		Data		Error Check (CRC16)	
			High	Low	High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	

CRC16

### 1.2.4 Read Input Register (Func 04–04H)

Read the Binary data of Input Registers (3X reference) in Slave device.

- **Query (Master)**

Slave Address	Function	Starting Address		No. of Points		Error Check (CRC16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

← CRC16 →

- **Response (Slave)**

Slave Address	Function	Byte Count	Data	Data	Data	Error Check (CRC16)	
						Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

← CRC16 →

### 1.2.5 Force Single Coil (Func 05–05 H)

Turns ON (FF00 H) or OFF (0000 H) of single coil (0X reference) status within slave.

- **Query (Master)**

Slave Address	Function	Coil Address		Preset Data		Error Check (CRC16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

← CRC16 →

- **Response (Slave)**

Slave Address	Function	Coil Address		Preset Data		Error Check (CRC16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

← CRC16 →

### 1.2.6 Preset Single Register (Func 06–06H)

Read the Binary data of single Holding Registers (4X reference) in Slave device.

▪ **Query (Master)**

Slave Address	Function	Register Address		Preset Data		Error Check (CRC16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

← CRC16 →

▪ **Response (Slave)**

Slave Address	Function	Register Address		Preset Data		Error Check (CRC16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

← CRC16 →

### 1.2.7 Preset Multiple Register (Func 16–10H)

Write the Binary data of Holding Registers (4X reference) consecutively in Slave device.

▪ **Query (Master)**

Slave Address	Function	Starting Address		No. of Register		Byte Count	Data		Data		Error Check (CRC16)	
		High	Low	High	Low		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

← CRC16 →

▪ **Response (Slave)**

Slave Address	Function	Starting Address		No. of Register		Error Check (CRC16)	
		High	Low	High	Low	Low	High
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

← CRC16 →

Please use the Single Register Write function rather than Multi Register Write function if you use the slave(device) connecting with external devices such as PLC, Graphic Panel, except in the case of download that presets the minimum/maximum or basic value of parameter by Input specifications in PC Loader Program.

### 1.2.8 Exception Response-Error Code

If occurs an error, send a response command and transmit each Exception Code after set(1) the highest level bit of received command(Function).

Slave Address	Function +80 H	Exception Code	Error Check (CRC16)	
			Low	High
1Byte	1Byte	1Byte	1Byte	1Byte

- ILLEGAL FUNCTION (Exception Code: 01 H): When a command is not supported
  - ILLEGAL DATA ADDRESS (Exception Code: 02 H): When Reserved area is read
  - ILLRGAL DATA VALUE (Exception Code: 03 H): When data write to out of setting range is requested.
  - SLAVE DEVICE FAILURE (Exception Code: 04 H): When the parameter is locked or communication write is disable.
  - SLAVE DEVICE BUSY (Exception Code: 06 H): When the device status cannot perform the requested order.
- ※ When the exception response situation, the device do not respond data, but send exception code only.

## 1.3 Autonics Modbus Address System

- **Parameter address structure**

The parameter address is written in form 'Reference number - Decimal address (Hexadecimal address).

For example, if the parameter address is **301001(03E8)**, it means that **3** is Reference number, **01001** is Decimal address (DEC), **03E8** is Hexadecimal address (HEX).

- **Reference number per each FUNC**

Reference	Function
0	FUNC 01[R], FUNC 05[W], FUNC 15[MW]
1	FUNC 02[R]
3	FUNC 04[R]
4	FUNC 03[R], FUNC 06[W], FUNC 16[MW]

- **Correlation between decimal address and hexadecimal address**

The parameter address can be somewhat different for each manufacturer because the regulation for a starting number is not defined.

Autonics Modbus address is started at '1' for decimal (DEC) address, and at '0' for hexadecimal (HEX). So, decimal (DEC) address values are +1 for Hex (HEX) address values.



**Ex.**

03E8(HEX) → 1001(DEC) (1000 + 1)

07D0(HEX) → 2001(DEC) (2000 + 1)

157C(HEX) → 5501(DEC) (5500 + 1)

## 2 Modbus Mapping Table

- **The meaning of HI/LO address**

Some parameters of BD series divide the value into two addresses (HI/LO) because it exceeds the maximum value ( $2^{16}$ , 16 bit) that can be sent from one address.

When inputting value greater than the maximum ( $2^{16}$ , 16 bit), convert it to hexadecimal (HEX), enter up to 4 digits (low 16bit) into the LO address and over 5 digits (high 16 bit) into the HI address.

For example, when inputting a value '99999' into 'Output hysteresis' parameter, convert '99999' into the hexadecimal value, '**1869F**'. Input '**1**'(0x0001) into HI address (OUT HYS HI [Output hysteresis], 400065(0040)) and '**869F**'(0x869F) into LO address (OUT HYS LO [Output hysteresis], 400066(0041)), and send them.

If under the maximum ( $2^{16}$ , 16 bit) is needed to be set, input '0'(0x0000) into HI address and the hexadecimal value (HEX) into LO address.

### 2.1 Force Single Coil (Function: 05)

Execute the function by communication input.

- **Amplifier unit - channel 1**

NO	FUNC	R/W	Description	Setting range
00001(0000)	05	W	Excutes sensing optimization	0: OFF 1: ON
00002(0001)	05	W	Sets zero adjustment	
00003(0002)	05	W	Dismisses zero adjustment	
00004(0003)	05	W	Auto sensitivity adjustment (Teaching)	
00005(0004)	05	W	Initializes HIGH/LOW PEAK value	
00006(0005)	05	W	Initializes current BANK	
00007(0006)	05	W	Initializes all BANK	

- **Address range of channel 1 to channel 8 (add 1000 per channel)**

NO	Description
00001(0000) to 00007(0006)	Master
01001(03E8) to 01007(03EE)	Slave 1
02001(07D0) to 02007(07D6)	Slave 2
03001(0BB8) to 03007(0BBE)	Slave 3
04001(0FA0) to 04007(0FA6)	Slave 4
05001(1388) to 05007(138E)	Slave 5
06001(1770) to 06007(1776)	Slave 6
07001(1B58) to 07007(1B5E)	Slave 7

## 2.2 Read Input Status (Function: 02)

These parameters are related to LED display and analog output of amplifier unit.

### ▪ Amplifier unit - channel 1

NO	FUNC	R/W	Description	Setting range
10001(0000)	02	R	LED OUT HI	0: OFF 1: ON
10002(0001)	02	R	LED OUT GO	
10003(0002)	02	R	LED OUT LOW	
10004(0003)	02	R	LED OUT ALARM	
10005(0004)	02	R	LED SV HI	
10006(0005)	02	R	LED SV LOW	
10007(0006)	02	R	LED SV RV	
10008(0007)	02	R	LED SV ANALOG	
10009(0008)	02	R	LED LASER	
10010(0009)	02	R	LED RANGE	
10011(000A)	02	R	LED CALC	
10012(000B)	02	R	ANALOG OUT TYPE	0: CURRENT 1: VOLT
10013(000B)to 10020(0014)	02	R	Reserved	

### ▪ Amplifier unit - address range of channel 1 to channel 8 (add 1000 per channel)

NO	Description
10001(0000) to 10012(000B)	Master
11001(03E8) to 11012(03F3)	Slave 1
12001(07D0) to 12012(07DB)	Slave 2
13001(0BB8) to 13012(0BC3)	Slave 3
14001(0FA0) to 14012(0FAB)	Slave 4
15001(1388) to 15012(1393)	Slave 5
16001(1770) to 16012(177B)	Slave 6
17001(1B58) to 17012(1B43)	Slave 7



## 2.3 Read Input Registers (Function: 04)

### 2.3.1 Amplifier unit

#### ▪ Amplifier unit model information - channel 1

NO	FUNC	R/W	Description	Setting range
30001(0000)	04	R	Product number H	-
30002(0001)	04	R	Product number L	-
30003(0002)	04	R	Hardware Version	-
30004(0003)	04	R	Software Version	-
30005(0004)	04	R	Model number 1	'BD'
30006(0005)	04	R	Model number 2	'A1'
30007(0006)	04	R	Model number 3	
30008(0006)	04	R	Model number 4	
30009(0008)	04	R	Model number 5	
30010(0009)	04	R	Reserved	-
30011(000A)	04	R	Serial number1	
30012(000B)	04	R	Serial number2	
30013(000C)	04	R	Serial number3	
30014(000D)	04	R	Serial number4	
30015(000E)	04	R	Connected sensor head model number	30, 65, 100
			Reserved	

#### ▪ Amplifier unit data - channel 1

NO	FUNC	R/W	Description	Setting range		
30101(0064)	04	R	Present Value HI	-99999 to 99999 (Change display digit according to 'Display digit' parameter)		
30102(0065)	04	R	Present Value LO			
30103(0066)	04	R	Setting Value HI	-99999 to 99999		
30104(0067)	04	R	Setting Value LO			
30105(0068)	04	R	Display status	Bit	Parameter name	Setting range
				0	LED OUT HI	0: OFF 1: ON
				1	LED OUT GO	
				2	LED OUT LOW	
				3	LED OUT ALARM	
				4	LED SV HI	
				5	LED SV LOW	
6	LED SV RV					

NO	FUNC	R/W	Description	Setting range		
				7	LED SV ANALOG	
				8	LED LASER	
				9	LED RANGE	
				10	LED CALC	
				11	ANALOG OUT TYPE	0: CURRENT, 1: VOLT
				12	SV BANK MODE	0: NONE 1: BANK
30106(0069)	04	R	HIGH Peak value HI	-99999 to 99999		
30107(006A)	04	R	HIGH Peak value LO			
30108(006B)	04	R	LOW Peak value HI	-99999 to 99999		
30109(006C)	04	R	LOW Peak value LO			
30110(006D)	04	R	ERROR	0: NONE 1: HEAD 2: LASER 4: MEMORY 8: AMP-C 16: VER 32: OUT 64: AIF 128: OUT CURR 256: DARK 512: BRIGHT 1024: FILTER DELAY 2048: RANGE 4096: LASER OFF		
30111(006E)	04	R	Decimal point of PV Value	0: 0.000 1: 0.00 2: 0.0 3: 0		

- **Amplifier unit - address range of channel 1 to channel 8 (add 1000 per channel)**

NO	Description
30001(0000) to 30201(00C8)	Master
31001(03E8) to 31201(04B0)	Slave 1
32001(07D0) to 32201(0898)	Slave 2
33001(0BB8) to 33201(0C80)	Slave 3
34001(0FA0) to 34201(1068)	Slave 4
35001(1388) to 35201(1450)	Slave 5
36001(1770) to 36201(1838)	Slave 6
37001(1B58) to 37201(1C20)	Slave 7

### 2.3.2 Communication converter

- **Communication converter model information**

NO	FUNC	R/W	Description	Setting range
38001(1F40)	04	R	Product number H	-
38002(1F41)	04	R	Product number L	-
38003(1F42)	04	R	Hardware Version	-
38004(1F43)	04	R	Software Version	-
38005(1F44)	04	R	Model number 1	"BD"
38006(1F45)	04	R	Model number 2	"CR"
38007(1F46)	04	R	Model number 3	"S"
38008(1F47)	04	R	Model number 4	-
38009(1F48)	04	R	Model number 5	-
38010(1F49)	04	R	Model number 6	-
38011(1F4A)	04	R	Model number 7	-
38012(1F4B)	04	R	Model number 8	-
38013(1F4C)	04	R	Model number 9	-
38014(1F4D)	04	R	Model number 10	-
38015(1F4E)	04	R	Serial number 1	-
38016(1F4F)	04	R	Serial number 2	-
38017(1F50)	04	R	Serial number 3	-
38018(1F51)	04	R	Serial number 4	-
38019(1F52)	04	R	Reserve	-
38020(1F53)	04	R	Reserve	-
38021(1F54)	04	R	Reserve	-
38022(1F55)	04	R	Reserve	-
38023(1F56)	04	R	Parameter change flag	-
38024(1F57)	04	R	The number of connected amplifier unit	1 to 8

## 2.4 Read Holding Registers (Function: 03), Preset Single Register (Function: 06), Preset Multiple Registers (Function: 16, 10 Hex)

### ▪ Sensitivity setting group - channel 1

NO	FUNC	R/W	Description	Setting range
40001(0000)	03/06/16	R/W	HIGH HI [Sensitivity high limit setting value]	-99999 to 99999
40002(0001)	03/06/16	R/W	HIGH LO [Sensitivity high limit setting value]	
40003(0002)	03/06/16	R/W	LOW HI [Sensitivity low limit setting value]	-99999 to 99999
40004(0003)	03/06/16	R/W	LOW LO [Sensitivity low limit setting value]	

### ▪ Amplifier unit parameter group 1 [PARAM 1] - channel 1

NO	FUNC	R/W	Description	Setting range
40051(0032)	03/06/16	R/W	RSPD HI [Response time]	0: 330 $\mu$ s
40052(0033)	03/06/16	R/W	RSPD LO [Response time]	1: 500 $\mu$ s
				2: 1ms
				3: 2ms
				4: 5ms
40053(0034)	03/06/16	R/W	SENS HI [Teaching mode]	0: 1PNT
40054(0035)	03/06/16	R/W	SENS LO [Teaching mode]	1: 2PNT
40055(0036)	03/06/16	R/W	NO.NC HI [Output type]	0: NO
40056(0037)	03/06/16	R/W	NO.NC LO [Output type]	1: NC
40057(0038)	03/06/16	R/W	DISP HI [PV display]	0: STND: 0
40058(0039)	03/06/16	R/W	DISP LO [PV display]	1: SCALE: 1
40059(003A)	03/06/16	R/W	DOT HI [Display digit]	0: 0.000
40060(003B)	03/06/16	R/W	DOT LO [Display digit]	1: 0.00
				2: 0.0
				3: 0
40061(003C)	03/06/16	R/W	H-SC HI [High display scale]	-99999 to 99999
40062(003D)	03/06/16	R/W	H-SC LO [High display scale]	
40063(003E)	03/06/16	R/W	L-SC HI [Low display scale]	-99999 to 99999
40064(003F)	03/06/16	R/W	L-SC LO [Low display scale]	
40065(0040)	03/06/16	R/W	OUT HYS HI [Hysteresis]	-99999 to 99999
40066(0041)	03/06/16	R/W	OUT HYS LO [Hysteresis]	

NO	FUNC	R/W	Description	Setting range
40067(0042)	03/06/16	R/W	H-ANL-SC HI [High analog output scale]	-99999 to 99999
40068(0043)	03/06/16	R/W	H-ANL-SC LO [High analog output scale]	
40069(0044)	03/06/16	R/W	L-ANL-SC HI [Low analog output scale]	-99999 to 99999
40070(0045)	03/06/16	R/W	L-ANL-SC LO [Low analog output scale]	
40071(0046)	03/06/16	R/W	ERR.OUT HI [Error output]	0: KEEP
40072(0047)	03/06/16	R/W	ERR.OUT LO [Error output]	1: FIX
40073(0048)	03/06/16	R/W	FIX.OUT HI [Fixed output]	400 to 2000: Analog output = 4 to 20mA 0 to 5000: Analog output = 0 to 5V
40074(0049)	03/06/16	R/W	FIX.OUT LO [Fixed output]	1000 to 5000: Analog output = 1 to 5V -5000 to 5000: Analog output = -5 to 5V

▪ Amplifier unit parameter group 2 [PARR2] - channel 1

NO	FUNC	R/W	Description	Setting range
40101(0064)	03/06/16	R/W	CALC HI [Calculation]	0: OFF
40102(0065)	03/06/16	R/W	CALC LO [Calculation]	1: ADD-AB 2: SUB-AB 3: AVG
40103(0066)	03/06/16	R/W	GAIN HI [Gain]	0: 1
40104(0067)	03/06/16	R/W	GAIN LO [Gain]	1: 2 2: 3
40105(0068)	03/06/16	R/W	FILTER HI [Filter]	0: AVF
40106(0069)	03/06/16	R/W	FILTER LO [Filter]	1: DIFF
40107(006A)	03/06/16	R/W	AVF HI [Samples for averaging]	0: 1 1: 2 2: 4 3: 8 4: 16 5: 32 6: 64
40108(006B)	03/06/16	R/W	AVF LO [Samples for averaging]	7: 128 8: 256 9: 512 10: 1024 11: 2048 12: 4096
40109(006C)	03/06/16	R/W	MEDIAN HI [Samples for median]	0: OFF 1: 3 2: 5
40110(006D)	03/06/16	R/W	MEDIAN LO [Samples for median]	3: 7 4: 15 5: 31
40111(006E)	03/06/16	R/W	HOLD HI [Hold]	0: OFF 1: PEAK 2: BOTTOM
40112(006F)	03/06/16	R/W	HOLD LO [Hold]	3: P-P 4: SAMPLE 5: AVG
40113(0070)	03/06/16	R/W	HOLD.T HI [Hold timing input]	0: T-IN
40114(0071)	03/06/16	R/W	HOLD.T LO [Hold timing input]	1: AT.UP 2: AT.DW

NO	FUNC	R/W	Description	Setting range
40115(0072)	03/06/16	R/W	AT.LV HI [Auto trigger level]	-99999 to 99999
40116(0073)	03/06/16	R/W	AT.LV LO [Auto trigger level]	
40117(0074)	03/06/16	R/W	AT.HYS HI [Auto trigger hysteresis]	-99999 to 99999
40118(0075)	03/06/16	R/W	AT.HYS LO [Auto trigger hysteresis]	
40119(0076)	03/06/16	R/W	T-MOD HI [Timer]	0: OFF 1: OND 2: OFD
40120(0077)	03/06/16	R/W	T-MOD LO [Timer]	
40121(0078)	03/06/16	R/W	TIME HI [Timer value]	0 to 9999
40122(0079)	03/06/16	R/W	TIME LO [Timer value]	

▪ **Amplifier unit parameter group 3 [PARA3] - channel 1**

NO	FUNC	R/W	Description	Setting range
40151(0096)	03/06/16	R/W	D-IN1 HI [External input 1]	0: OFF 1: T-IN 2: OUT.CLR 3: L-OFF 4: ZERO 5: BANK-A 6: BANK-B
40152(0097)	03/06/16	R/W	D-IN1 LO [External input 1]	
40153(0098)	03/06/16	R/W	D-IN2 HI [External input 2]	
40154(0099)	03/06/16	R/W	D-IN2 LO [External input 2]	
40155(009A)	03/06/16	R/W	D-IN3 HI [External input 3]	
40156(009B)	03/06/16	R/W	D-IN3 LO [External input 3]	
40157(009C)	03/06/16	R/W	D-IN4 HI [External input 4]	
40158(009D)	03/06/16	R/W	D-IN4 LO [External input 4]	

▪ **Amplifier unit parameter group 4 [PARA4] - channel 1**

NO	FUNC	R/W	Description	Setting range
40201(00C8)	03/06/16	R/W	DIR HI [Display direction]	0: Normal
40202(00C9)	03/06/16	R/W	DIR LO [Display direction]	1: Reverse
40203(00CA)	03/06/16	R/W	BANK HI [Bank]	0: BANK-0
40204(00CB)	03/06/16	R/W	BANK LO [Bank]	1: BANK-1
				2: BANK-2
				3: BANK-3
40205(00CC)	03/06/16	R/W	SAVE HI [Saving mode]	0: OFF
40206(00CD)	03/06/16	R/W	SAVE LO [Saving mode]	1: SAVE1
				2: SAVE2
40207(00CE)	03/06/16	R/W	LOCK HI [Lock mode]	0: OFF
40208(00CF)	03/06/16	R/W	LOCK LO [Lock mode]	1: LOCK1
				2: LOCK2
				3: LOCK3
40209(00D0)	03/06/16	R/W	PNP.NPN HI [PNP, NPN output type]	0: NPN
40210(00D1)	03/06/16	R/W	PNP.NPN LO [PNP, NPN output type]	1: PNP
40211(00D2)	03/06/16	R/W	ANALOG HI [ANALOG output type]	0: OFF
				1: 4-20mA
				2: 0-5V
40212(00D3)	03/06/16	R/W	ANALOG LO [ANALOG output type]	3: 1-5V
				4: -5-5V
40213(00D4)	03/06/16	R/W	DISP SV TYPE HI [Setting value (SV) display type]	0: HIGH
				1: LOW
				2: RV
40214(00D5)	03/06/16	R/W	DISP SV TYPE LO [Setting value (SV) display type]	3: ANALOG
				4: BANK

▪ **Amplifier unit - address range of channel 1 to channel 8 (add 1000 per channel)**

NO	Description
40001(0000) to 40350(015D)	Master
41001(03E8) to 41350(0545)	Slave 1
42001(07D0) to 42350(092D)	Slave 2
43001(0BB8) to 43350(0D15)	Slave 3
44001(0FA0) to 44350(10FD)	Slave 4
45001(1388) to 45350(14E5)	Slave 5
46001(1770) to 46350(18CD)	Slave 6
47001(1B58) to 47350(1CB5)	Slave 7



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