AD-4402 OP-22

INSTRUCTION MANUAL

PROFIBUS Interface

WM : PD4000303

A&D Company, Limited

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Contents

1. Compliance

1.1.1. Compliance with FCC rules

- Please note that this equipment generates, uses and can radiate radio frequency energy. This equipment has been tested and has been found to comply with the limits of a Class A computing device pursuant to Subpart J of Part 15 of FCC rules. These rules are designed to provide reasonable protection against interference when this equipment is operated in a commercial environment. If this unit is operated in a residential area it may cause some interference and under these circumstances the user would be required to take, at his own expense, whatever measures are necessary to eliminate the interference.
  (FCC = Federal Communications Commission in the U.S.A.)

1.1.2. Compliance with Council Directives

CE This appliance complies with the statutory EMC (Electromagnetic Compatibility) directive 89/336/EEC and the Low Voltage Directive 73/23/EEC for safety of electrical equipment designed for certain voltages.

Note: The displayed value may be adversely affected under extreme electromagnetic influences.

2. Outline and Features

- The option, OP-22, is a special interface only for the AD-4402 weighing indicator. The indicator is used as a slave DP device in PROFIBUS.
  PROFIBUS: Process filed bus
  DP: Decentralized Periphery

- With the option installed in the indicator, the master (PLC) can control the operation which is to be stored the I/O settings and to read data into the memory of the master.
  PLC: Programmable LogicController or Process Controller

- There are two operation methods for the indicator. "Command without handshake (Command Bit)" and "Command with handshake (Command)".

Advice

- Knowledge of the weighing indicator and PROFIBUS specifications are required for proper understanding of this instruction manual.

- Refer to the special references for PROFIBUS specifications, technical terms, wiring, settings, operation and control of PROFIBUS.

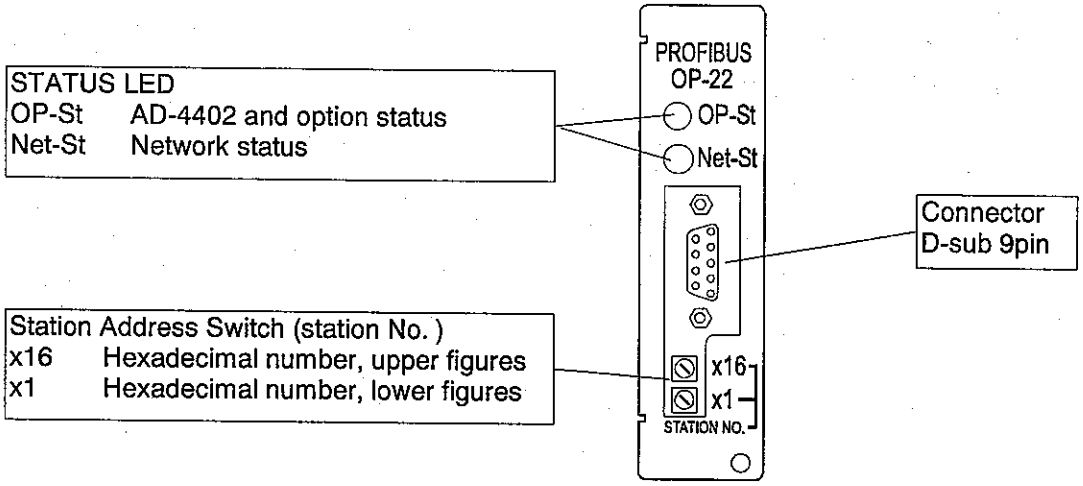
- Use authorized cables and connectors for PROFIBUS.

Caution

- **The interface occupies 12 bytes for OUT DATA and 20 bytes for IN DATA in the memory area of the PLC. Always use the allocated memory area when connecting to other slave devices.**

- **The IN DATA will be all zeroes, if the AD-4402 is not in the weighing mode.**

3. Panel and Names



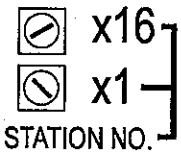
3.1.1. STATION NO. and Baud Rate

Station Address

Set a station address (station No.) of this slave device using two switches.

Switches x1, x16 (16^0, 16^1)

Range 0 to 125.



Example: For address 44, Turn the dial to 2 (x16), C (x1).

Baud Rate

Baud rate is automatically detected. It is not necessary to set the rate.

9.6	kbps
19.2	kbps
93.75	kbps
187.5	kbps
500	kbps
1.5	Mbps
3	Mbps
6	Mbps
12	Mbps

3.1.2. Status LED

These LEDs indicate the status of the interface.

	OP-St (AD-4402 and option status)	Net-St (Network status)
Green ON	Device operational	On-line (Normal)
Flashing Green	—	Off-line
Red ON	Unrecoverable fault	—
Flashing Red	Recoverable fault	Communication error

3.1.3. Connector (Terminal)

The pin connections are as follows:

Pin No.	Signal	Description
1	SHIELD	Protective ground
2	—	Not connected
3	RxD/TxD-P	Receive / send data, Data line B
4	CNTR-P	RTS (Request To Send)
5	DGND	Data ground
6	VP	Power supply
7	—	Not connected
8	RxD/TxD-N	Receive / send data, Data line A
9	—	Not connected

3.1.4. Communication

Modes Supported (Global Control Service)

- SYNC mode and FREEZE mode are supported.

Diagnostic Data

- Diagnostic data uses six bytes specified as DP standard. The rated paramters adapt to the diagnostic report specified at EN 50 170.

Connection to PROFIBUS

- Use bus termination.

- Maximum cable length according to transmission speed.

Baud rate	Maximum cable length for type A cable
9.6 kbps	1200m
19.2 kbps	1200m
93.75 kbps	1200m
187.5 kbps	1000m
500 kbps	400m
1.5 Mbps	200m
3 Mbps	100m
6 Mbps	100m
12 Mbps	100m

- Use authorized cables and connectors designed for PROFIBUS .

4. Installation

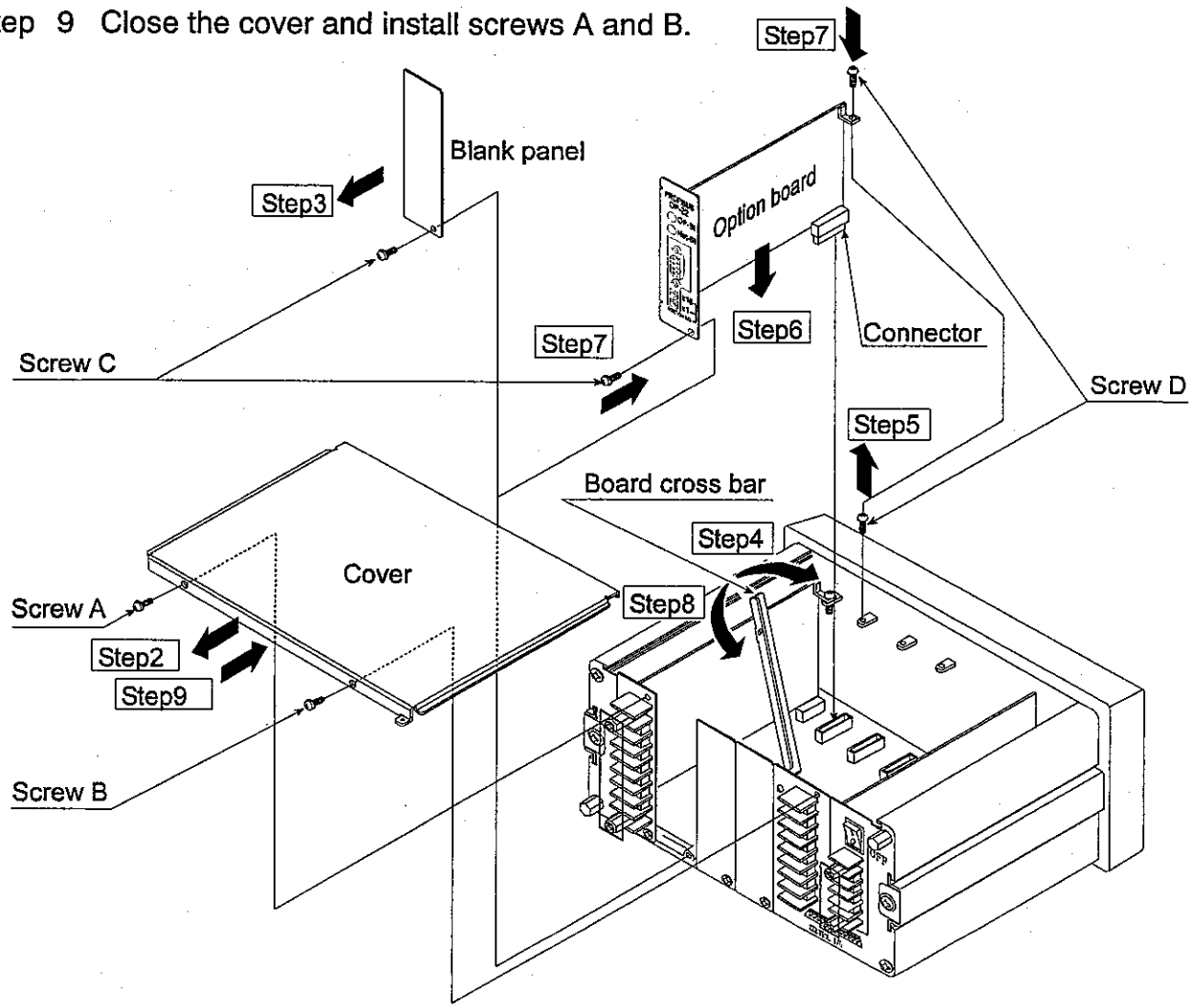
4.1.1. Installing the Option Board

- This option is to be installed into the AD-4402.
- This option can be installed into any option slot .

⚠Caution

- **Disconnect the power supply before the installation.**
- **Do not touch the wiring or internal portions of this device immediately after removing the power.**

Step 1 Remove the power cord and other cables from the AD-4402.
Step 2 Remove screws A and B to remove the cover.
Step 3 Remove screws C to remove the blank panels.
Step 4 Open the board cross bar.
Step 5 Remove screw D.
Step 6 Install the option board into the slot.
Step 7 Attach the option board with screws C and D.
Step 8 Close the board cross bar.
Step 9 Close the cover and install screws A and B.



5. PLC Memory

5.1. Address Map

- The **OUT DATA** (6 words) is used for storing commands or parameters into the AD-4402.
- The **IN DATA** (10 words) is used for storing reply data from the AD-4402.
- Use the hexadecimal system for data.

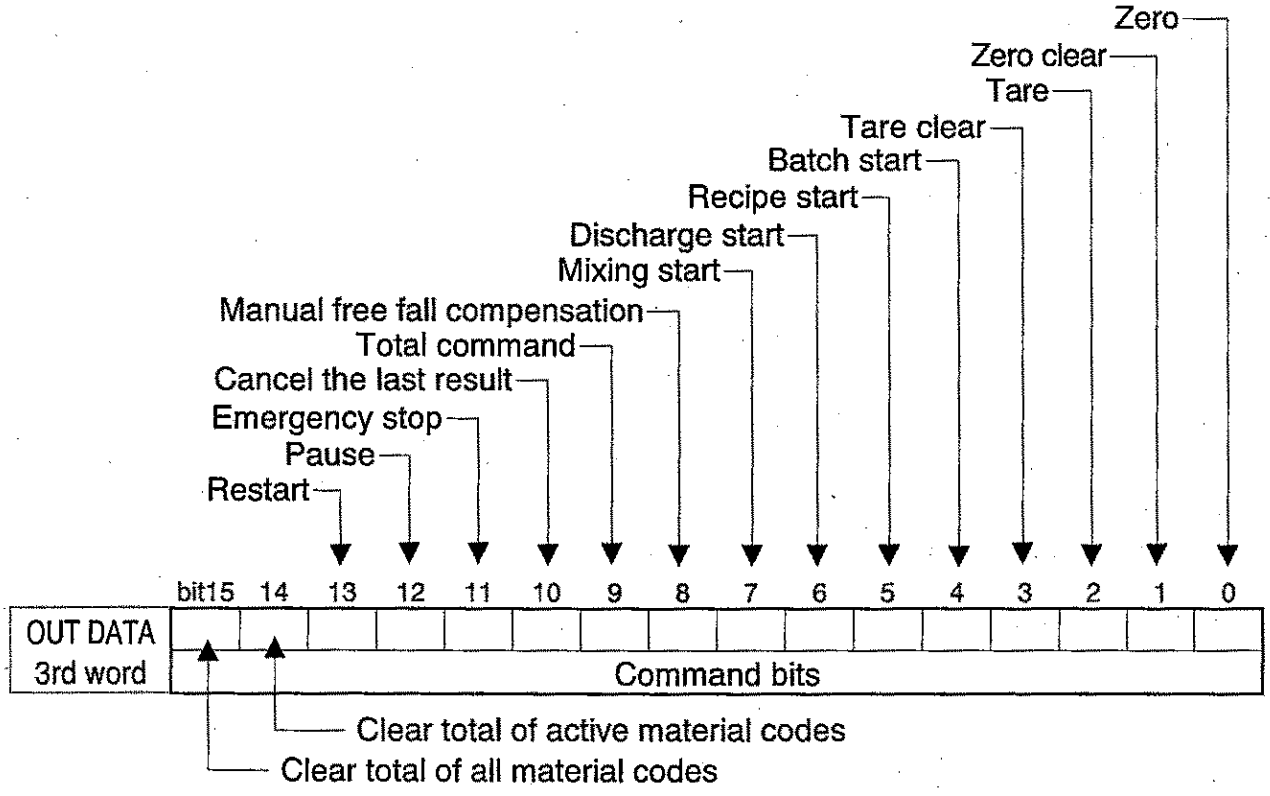
Caution

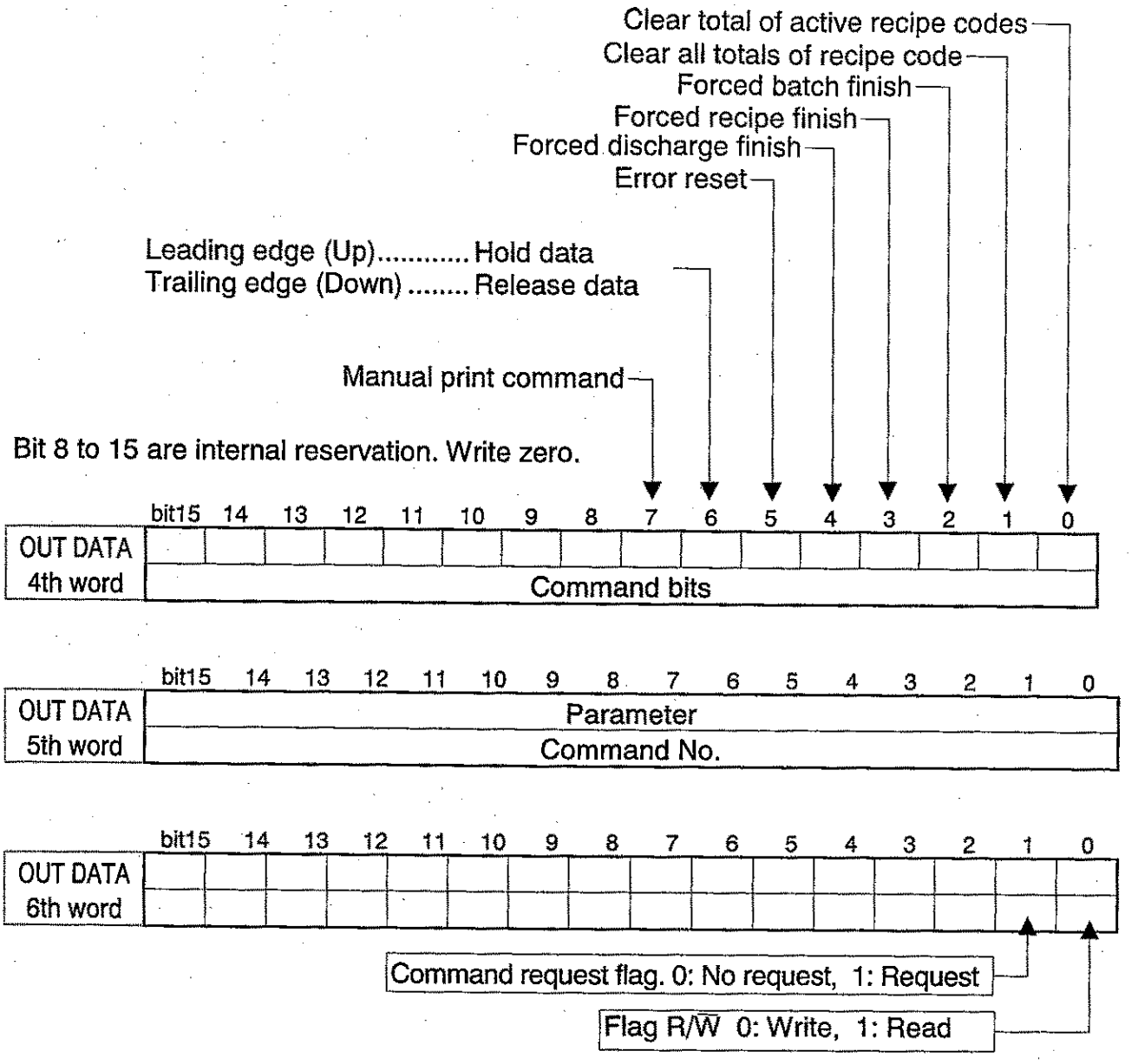
- **The interface occupies 12 bytes for OUT DATA and 20 bytes for IN DATA in the memory area of the PLC. Always use the allocated memory area when connecting to other slave devices.**

5.1.1. OUT DATA (6 words), PLC to AD-4402

	bit15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
OUT DATA 1st word	Parameters															
	Output data (Low order word)															

	bit15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
OUT DATA 2nd word	Parameters															
	Output data (High order word)															





Explanation of the OUT DATA

Output data	The bits to be used for the output command. Refer to "5.3.Command"
Command bits	The bits to assign function and use to each command bit. Refer to "5.2.Command Bits"
Command No.	The bits to specify the "command No.". Refer to "5.3.Command"
Flag R/$\overline{W}$	The bit to select the "read command" or "write command".
Internal reservation	Write zero.

5.1.2. IN DATA (10 words), AD-4402 to PLC

	bit15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
IN DATA 1st word	Gross															
	Weight data (Low order word)															

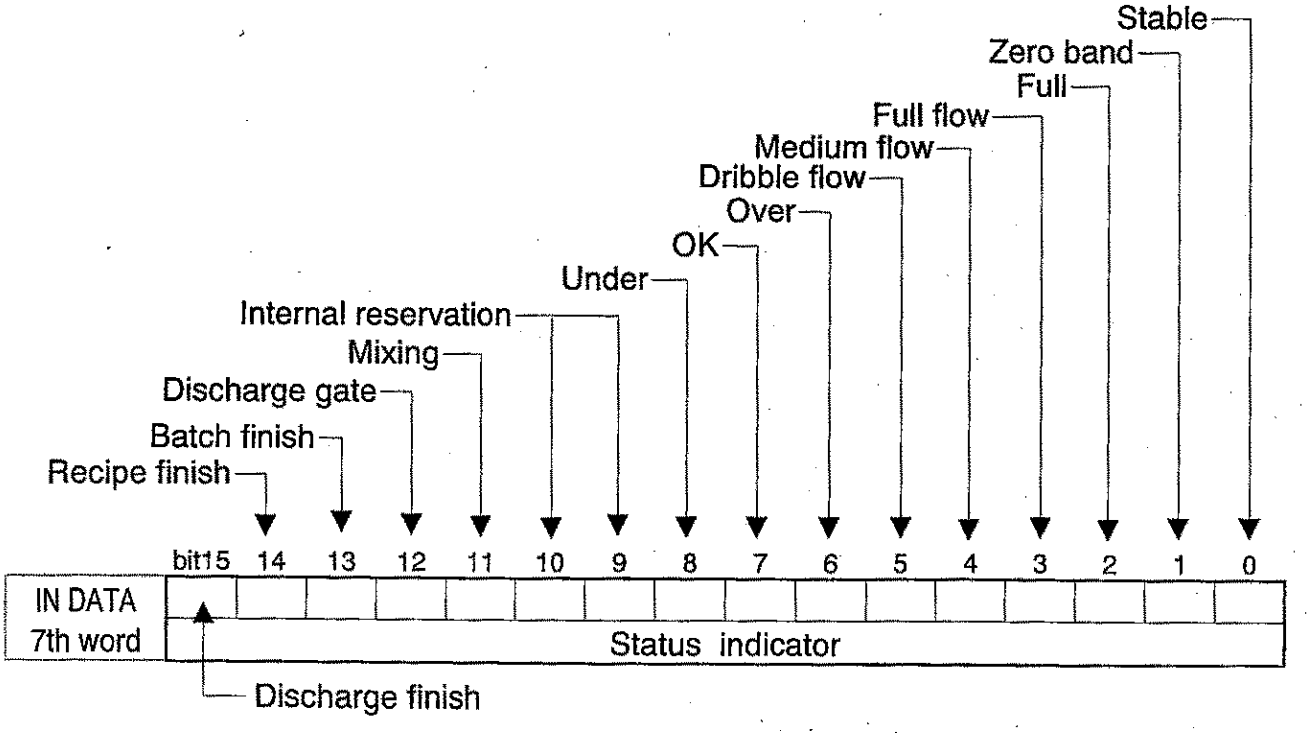
	bit15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
IN DATA 2nd word	Gross															
	Weight data (High order word)															

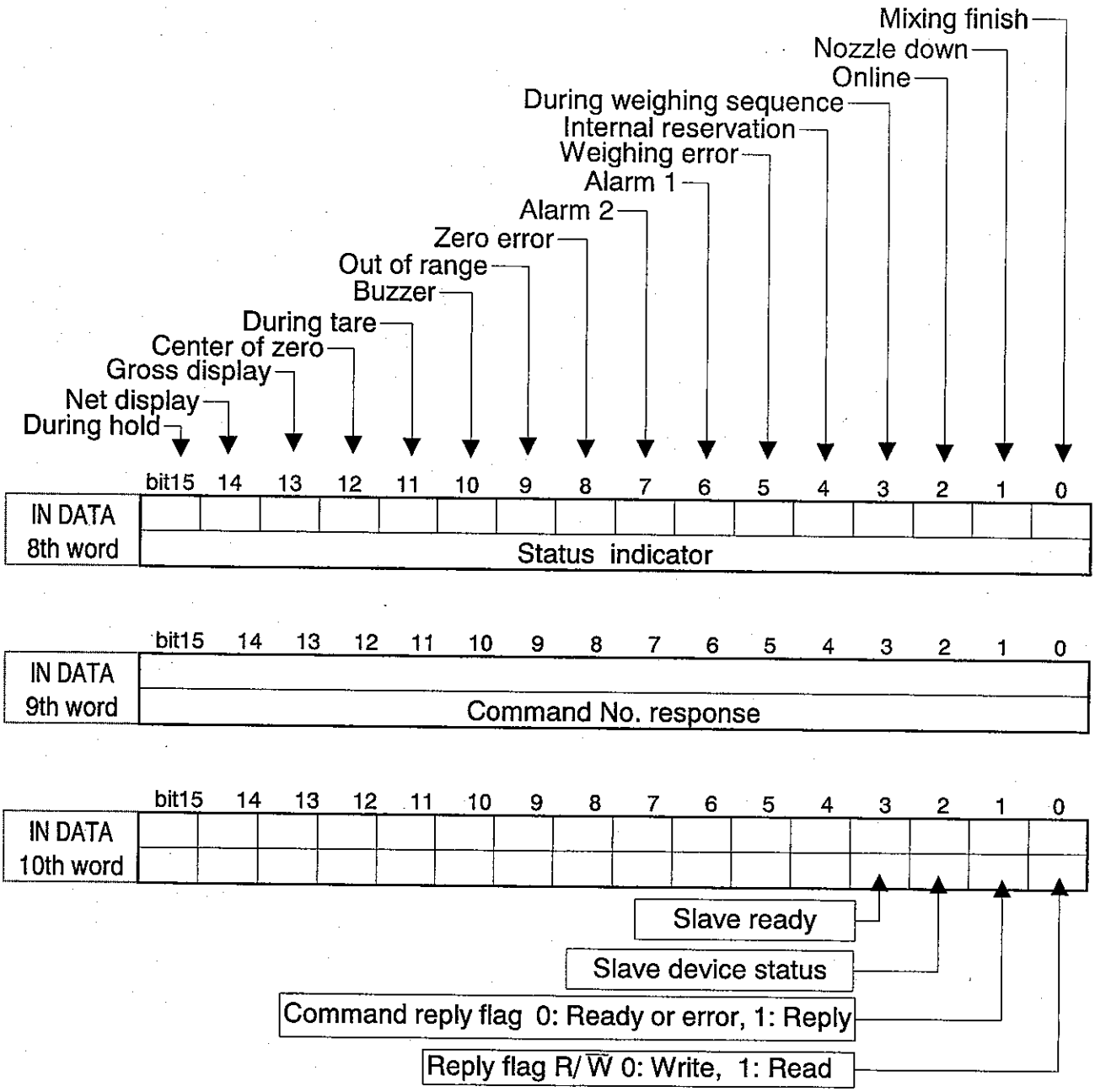
	bit15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
IN DATA 3rd word	Net															
	Weight data (Low order word)															

	bit15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
IN DATA 4th word	Net															
	Weight data (High order word)															

	bit15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
IN DATA 5th word																
	Input data (Low order word)															

	bit15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
IN DATA 6th word																
	Input data (High order word)															





Explanation of the IN DATA

Slave ready	When the AD-4402 is in the weighing mode or a status that can weigh, this bit is "ON". When this bit is "ON", the PLC can read the command reply data and write output data.
Command No. reply	It is reply data of the command No. .
Input data	It is reply data of the command.
Reply flag R/$\overline{W}$	It is reply data of read or write.
Internal reservation	Do not use these bits.
Status indicator	Status of AD-4402 can be monitored.

5.2. Command Bits

5.2.1. How to Use Command Bits

- Command bits can be stored in 3rd and 4th words
- When executing the function assigned to a bit, turn on the bit.
- The function has effect at the leading edge (rising edge) of the bit.
- Keep the signal level at least 30 msec.

	Function of Command Bit	
OUT DATA 3rd word	bit 0	Zero
	bit 1	Zero clear
	bit 2	Tare
	bit 3	Tare clear
	bit 4	Batch start
	bit 5	Recipe start
	bit 6	Discharge start
	bit 7	Mixing start
	bit 8	Manual free fall compensation
	bit 9	Total command
	bit 10	Cancel the last result
	bit 11	Emergency stop
	bit 12	Pause
	bit 13	Restart
	bit 14	Clear total of active material codes
	bit 15	Clear total of all material codes
OUT DATA 4th word	bit 0	Clear total of active recipe codes
	bit 1	Clear total of all recipe codes
	bit 2	Forced batch finish
	bit 3	Forced recipe finish
	bit 4	Forced discharge finish
	bit 5	Error reset
	bit 6	Leading edge (Up) ..... Hold data Trailing edge (Down)..... Release data
	bit 7	Manual print command
	bit 8 to bit 15	Internal reservation. (Do not change bit.)

5.2.2. Execution Procedure of Command Bits

Step 1 Turn off all bits of the "**Command bits**" in the PLC memory.
Step 2 Turn on the bit in the PLC memory, to execute the function.
Step 3 Then the AD-4402 executes the function.
Step 4 Turn off all bits of the "**Command bits**" in the PLC memory.

5.3. Commands

5.3.1. How to Use Commands

- Flag "**R/W**" specifies the "read command" or "write command".
  0: write command, 1: read command
- Specify a command to be executed for the "**Command No.**"
- Specify the data of an executed command for the "**Output data**".
  If the data is character, use ASCII code. If character data is not used, fill with space codes (20h).
- Commands have effect at the leading edge of "**Command request flag**".
  Keep the signal level more than 30 msec.
- The result of the command is input to "**Command reply flag**" and "**Command No. reply**".
- When the read command is executed, the result is input to "**Input data (Command reply data)**".

5.3.2. Command Execution Procedure

Ready

Step 1 Turn off the "**Command request flag**".
Step 2 Specify the flag "**R/W**".
0: write command, 1: read command
Step 3 Specify a command to be executed for "**Command No.**"
Step 4 If output data is needed, specify the data for "**Output data**".

Execution

Step 5 Confirm that the flag "**Slave ready**" is ON.
Step 6 Turn on the "**Command request flag**". It has effect at the leading edge.
Step 7 The AD-4402 replies.
The result is input into "**Command reply flag**", flag "**R/W**" and "**Command No. reply**".
Step 8 If it is a read command, data is input into "**Input data (Command reply data)**".

Finish

Step 9 Turn off the "**Command request flag**".

5.3.3. Read Command List

Command Name	Command No.	Note
Material name 1 (1st to 4th character)	1	OUT DATA, 5th word This data is stored in each material code. Specify a material code No. before the input. Specify a material code No. at "**Material code to store** (33)" of "**Write command**". During setting, material code No. can check by "**Material code to store**(33)" of "**Read command**". AFFC:Automatic free fall compensation
Material name 2 (5th to 8th character)	2	
Material name 3 (9th to 12th character)	3	
Material hopper	5	
Final	6	
Free fall	7	
Preliminary	8	
Optional preliminary	9	
Over	10	
Under	11	
Zero band	12	
Full	13	
Tare	14	
Supplementary flow open timer	15	
Supplementary flow close timer	16	
AFFC range	17	
Initial dribble supply	18	
Initial medium supply	19	
Total weight	20	
Total count	21	
Current material code	32	
Material code to store	33	
Weighing result	36	Last result is read.
Recipe name 1 (1st to 4th character)	40	This data is stored in each recipe codes. Specify a recipe code No. before the input. Specify a recipe code No. at "**Recipe code to store** (57)" of "**Write command**". During setting, recipe code can check by "**Recipe code to store**" of "**Read command**".
Recipe name 2 (5th to 8th character)	41	
Recipe name 3 (9th to 12th character)	42	
Material 1	44	
Material 2	45	
Material 3	46	
Material 4	47	
Material 5	48	
Material 6	49	
Material 7	50	
Material 8	51	
Material 9	52	
Material 10	53	
Total weight	54	
Total count	55	
Current recipe code	56	
Recipe code to store	57	
Error information	60	Refer to 5.4.Error information
Decimal point	61	
Current tare	64	Tare = Gross - Net

5.3.4. Write Command List

OUT DATA, 5th word

OUT DATA, 1st word and 2nd word

Command Name	Command No.	Output Data	Note
Material name 1 (1st to 4th character)	1	Characters data #	This data is stored in each material code. Specify a material code No. before the input. A material code No. specified at "**Material code to store** (33)" of "**Write command**". AFFC:Automatic free fall compensation
Material name 2 (5th to 8th character)	2		
Material name 3 (9th to 12th character)	3		
Material hopper	5	Numerical data	
Final	6		
Free fall	7		
Preliminary	8		
Optional preliminary	9		
Over	10		
Under	11		
Zero band	12		
Full	13		
Tare	14		
Supplementary flow open timer	15		
Supplementary flow close timer	16		
AFFC range	17		
Initial dribble supply	18		
Initial medium supply	19		
Recall material code	32	Code No. 0 to 99	
Material code to store	33		
Recipe name 1 (1st to 4th character)	40	Characters data #	This data is stored in each recipe codes. Specify a recipe code No. before the input. Specify a recipe code No. at "**Recipe code to store** (57)" of "**Write command**". Use "**Material 1**" at first and in order. Set "FFFFFFFF" to unused codes.
Recipe name 2 (5th to 8th character)	41		
Recipe name 3 (9th to 12th character)	42		
Material 1	44	Code No. 0 to 99	
Material 2	45		
Material 3	46		
Material 4	47		
Material 5	48		
Material 6	49		
Material 7	51		
Material 8	50		
Material 9	52		
Material 10	53		
Recall recipe code	56	Code No. 0 to 99	
Recipe code to store	57		

Use ASCII code for character data. If data is not used, fill with space codes (20h).

Control Command List

OUT DATA, 5th word

OUT DATA, 1st word and 2nd word

Command Name	Command No.	Output Data	Note
Zero	0	1	
Zero clear	0	2	
Tare	0	3	
Tare clear	0	4	
Batch start	0	5	
Recipe start	0	6	
Discharge start	0	7	
Mixing start	0	8	
Manual free fall compensation	0	10	
Total command	0	11	
Cancel the last result	0	12	
Emergency stop	0	13	
Clear total of each material code	0	14	Specify material code No. at "**Material code to store** (33)" of "**Write command**".
Clear total of each recipe code	0	15	Specify a recipe code No. at "**Recipe code to store**(57)" of "**Write command**".
Pause	0	22	
Restart	0	23	
Clear total of active material codes	0	24	
Clear total of all material codes	0	25	
Clear total of active recipe codes	0	26	
Clear total of all recipe codes	0	27	
Forced batch finish	0	36	
Forced recipe finish	0	37	
Forced discharge finish	0	38	
Error reset	0	44	
Manual print command	0	47	
Net display	0	49	
Gross display	0	50	

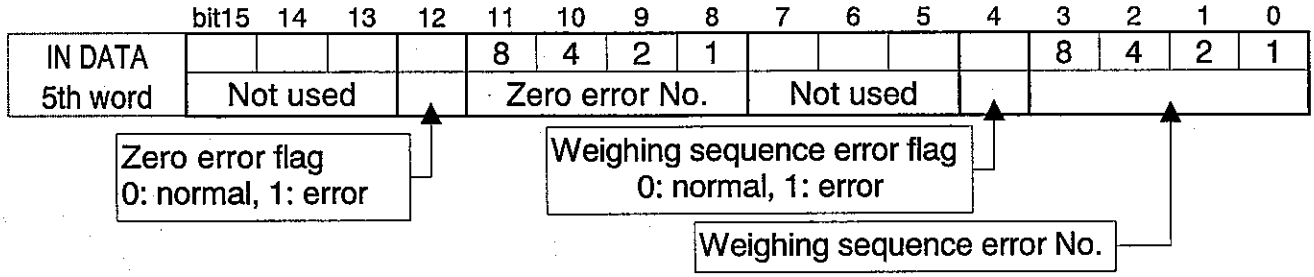
5.4. Error Information

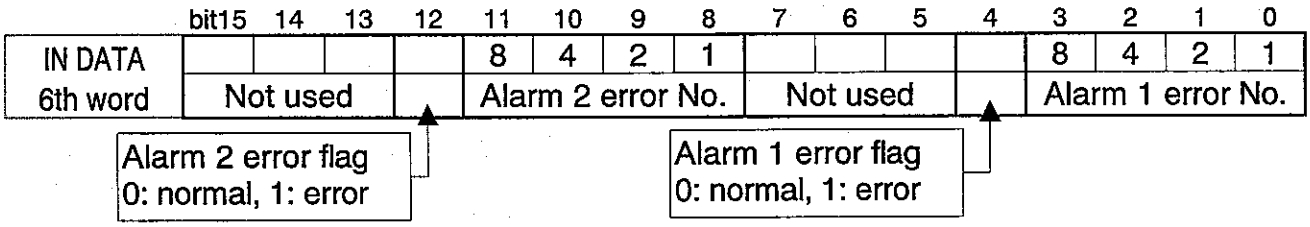
- When an error occurs, the error information from the AD-4402 can be read with "**Error information** (command No. 60)" of the "**Read command**".
- The "**Error No.**" and "**Error flag**" are input in "**IN DATA**" according to the type of error.
- An "**Error No.**" uses 4 bits.

Caution

- **The data of an "unused bit" is an undefined value.**
- **Refer to the AD-4402 instruction for the details of the error code.**

Error Information in IN DATA





Error No.

Type	No.	Cause and Treatment
Weighing sequence error No. SQ.ERR	0	The weighing sequence stopped. Cope with cause and restart the sequence.
	1	Safety check can not be completed. Check the safety.
	2	Under weight or over weight. Compensate weight and restart.
	3	There is a conflict in setpoint. Check setpoint.
	4	Time over of batch weighing. Check the gate and hopper remains.
	5	Time over of discharge. Check the discharge gate.
	6	The remains are not enough to weigh. Add material.
	8	Nozzle is touching the hopper. Check the nozzle.
	9	There is no tare (vessel) on the weighing pan.

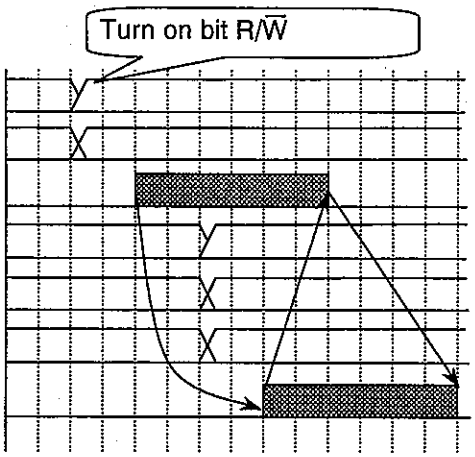
Type	No.	Cause and Treatment
Zero error ZR.ERR	0	Weighing value is out of zero band. Display can not be zeroed by zero compensation.
	1	Weighing value is out of tare condition. Display can not be zeroed by tare operation.
	2	Weighing value is not stable. Automatic zeroing or automatic tare can not performed at power on.
Alarm 1 **ALARM 1**	1	Weighing value is out of range.
	9	Emergency stop is executed. Emergency stop is executed by external input.
Alarm 2 **ALARM 2**	1	A/D converter is positive over count. Check the load cell cable.
	2	A/D converter is negative over count. Check the load cell cable.
	4	RAM error. Check the backup battery.

6. Timing Chart

6.1. Read Command

- Specify the data to be read at "**Command No.**"The reply data is input to "**Input data (Command reply data)**".

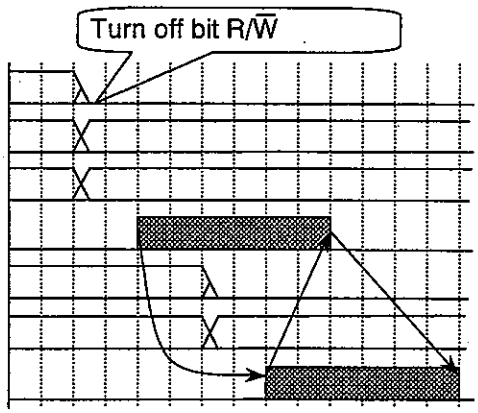
Flag R/$\overline{W}$ .....
Command No. .....
Command request flag .....
Reply flag R/$\overline{W}$ .....
Command No. response .....
Input data (Command reply data) .....
Command replay flag .....



6.2. Write Command

- Specify the data to write at "**Command No.**" Send the output data of "**OUT DATA**".

Flag R/$\overline{W}$ .....
Command No. .....
Output data .....
Command No. .....
Reply flag R/$\overline{W}$ .....
Command reply No. .....
Command replay flag .....



7. Monitor Mode

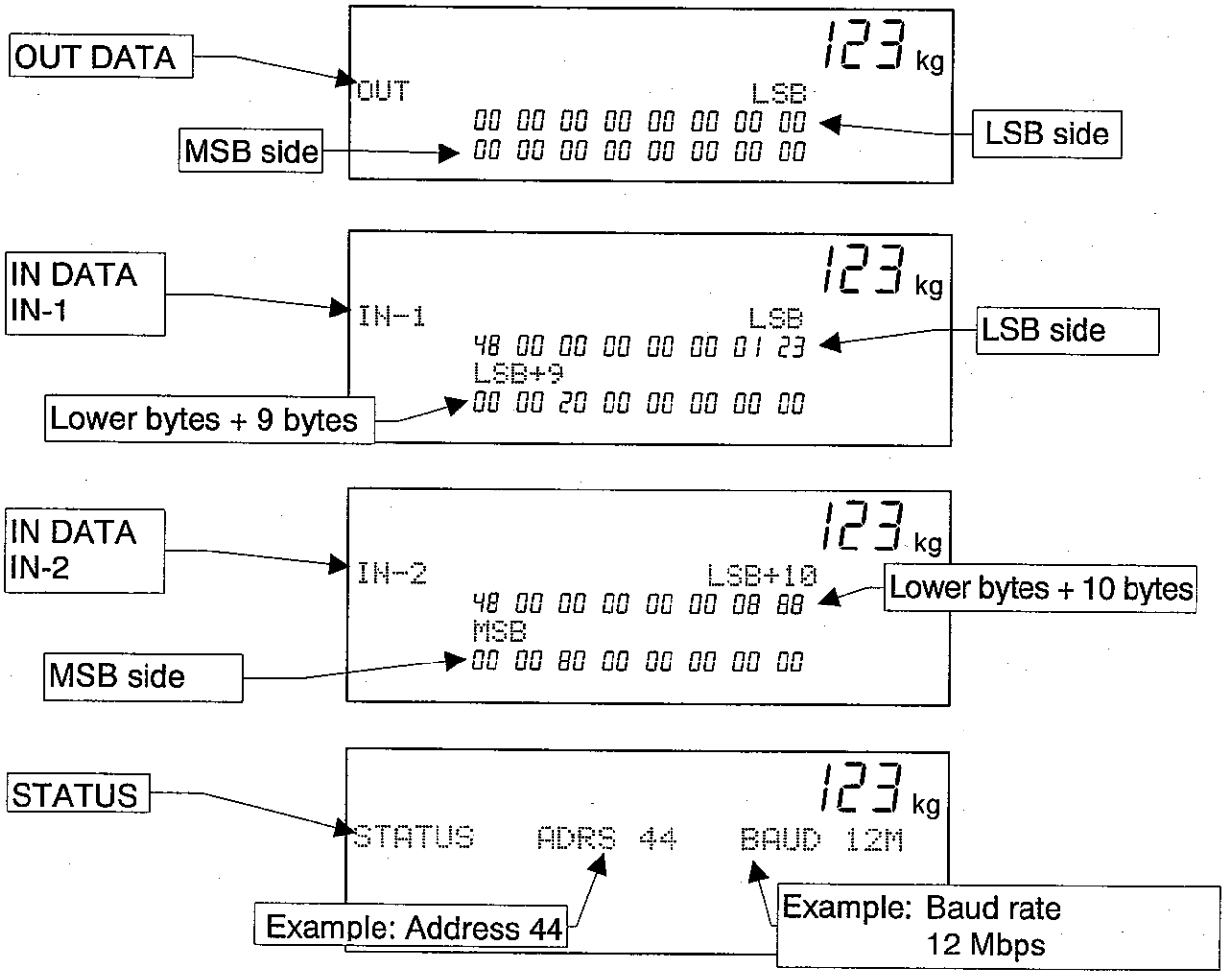
7.1. Operation and Indication

- This mode is used to monitor the condition of the indicator.
  The OUT DATA, IN DATA and STATUS can be monitored during operation. The mode does not need to stop a current communication and weighing sequence.
- Data is only displayed, can not be rewritten.
- The monitor format is hexadecimal numbers.

- Use the following keys to operate the monitor mode.
- Entering the monitor mode..... When weighing value is displayed, press and hold the **ENTER** key and press the ↓ key. Enter check menu with the ↓ key and the **ENTER** key.
  Menu: [Check] - [Monitor] - [Option] - [OP-22]

- Selecting a data..... The 1 key (Order of OUT → IN1 → IN2 → STATUS)
  The 2 key (Order of OUT → STATUS → IN2 → IN1)

- End key (Exit key)..... **ESC** key



7.2. Interface Status Monitor

Monitor Symbols	Descriptions
ADRS	Station address (In this mode, address is decimal)
BAUD	Baud rate
OFF_LINE	Off line
ERR:RAM	Hardware error
ERR:SPC3	
ERR:TIMEOUT	