User's Manual

CAN BUS INTERFACE Module

WE7081

YOKOGAWA
Yokogawa Electric Corporation

IM 707081-01E
1st Edition

Thank you for purchasing the WE7081 CAN BUS INTERFACE Module for the WE7000 PC-Based Measurement Instruments.

This user's manual contains useful information about the function, connection to the measuring station, operations of the software on the PC, and troubleshooting of the WE7081. This manual assumes that you will be using the WE7000 Control Software that is included with the measuring station.

The manual listed below contains general information about the WE7000 (primarily describes the operations of the measuring station, the optical interface module, the optical interface card, and the WE7000 Control Software) and is included with the measuring station.

Manual Title	Manual No.	Note
WE7000 User's Manual	IM 707001-01E	User's manual for the WE7000.

To ensure correct use, please read this manual thoroughly before beginning operation. After reading the manual, keep it in a convenient location for quick reference whenever a question arises during operation.

Notes

- **The contents of this manual describe WE7000 Control Software Ver. 4.6.0.0 and module software Ver. 2.01. The operating procedures and screen contents described in this manual may differ from those in other versions of the software.**
- The contents of this manual are subject to change without prior notice as a result of continuing improvements to the instrument's performance and functions.
- Every effort has been made in the preparation of this manual to ensure the accuracy of its contents. However, should you have any questions or find any errors, please contact your nearest YOKOGAWA dealer.
- Copying or reproducing all or any part of the contents of this manual without the permission of Yokogawa Electric Corporation is strictly prohibited.

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Revisions

1st Edition: May 2003

Disk No. WE21
1st Edition: May 2003 (YK)

Checking the Contents of the Package

Unpack the box and check the contents before operating the instrument. If some of the contents are not correct or missing or if there is physical damage, contact the dealer from which you purchased them.

Measurement Module

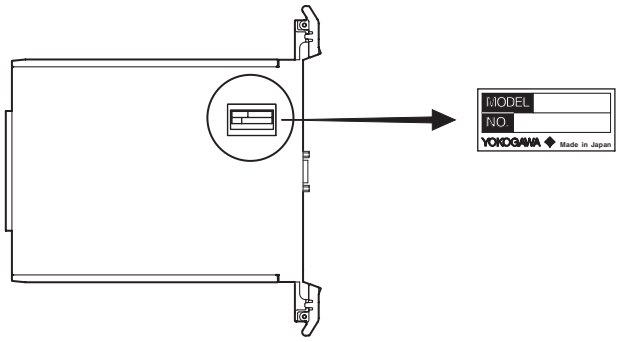
Check that the model name given on the name plate matches those on the order.

MODEL

Model	Suffix Code	Description
WE7081		CAN BUS INTERFACE Module
	/HE	English help message

NO. (Instrument Number)

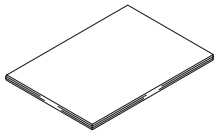
When contacting the dealer from which you purchased the instrument, please give them the instrument number.



Standard Accessories

The standard accessories below are supplied with the instrument. Check that all contents are present and that they are undamaged.

User's manual (this manual) 1 piece
IM 707081-01E



How to Use This Manual

Structure of the Manual

This user's manual consists of the following sections:

Chapter	Title	Description
1	**Explanation of Functions**	Explains the system configuration, functions, and setup operations.
2	**Hardware Preparation**	Explains how to install the module into the measuring station and how to connect the input.
3	**Troubleshooting and Maintenance**	Explains the procedures for troubleshooting and self testing.
4	**Specifications**	Explains the specifications of the module.
Appendix		Gives sample point tables.
Index		Index of contents.

Conventions Used in This Manual

Unit

k: Denotes "1000." Example: 100 kHz

K: Denotes "1024." Example: 720 KB

Bolded Characters

Bolded characters are mainly characters and numbers that appear on the display.

Safety Markings

The following markings are used in this manual.

Danger. Refer to corresponding location on the instrument. This symbol appears on dangerous locations on the instrument which require special instructions for proper handling or use. The same symbol appears in the corresponding place in the manual to identify those instructions.

WARNING Calls attention to actions or conditions that could cause serious injury or death to the user, and precautions that can be taken to prevent such occurrences

CAUTION Calls attentions to actions or conditions that could cause light injury to the user or damage to the instrument or user's data, and precautions that can be taken to prevent such occurrences.

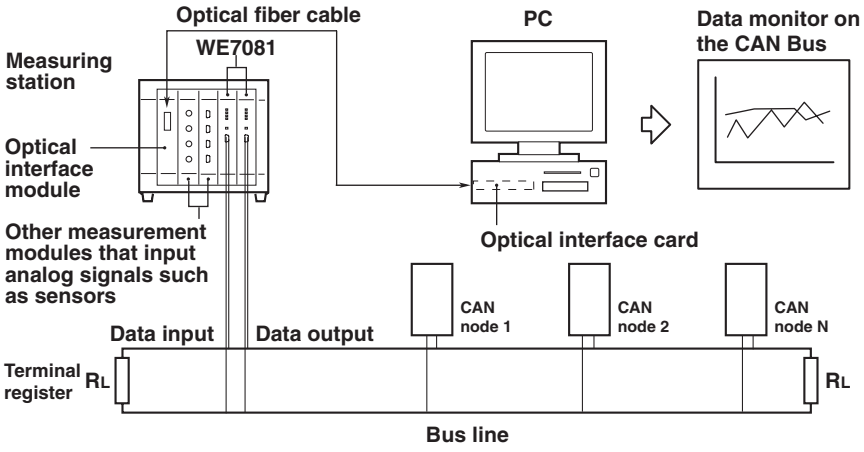
Note Calls attention to information that is important for proper operation of the instrument.

Contents

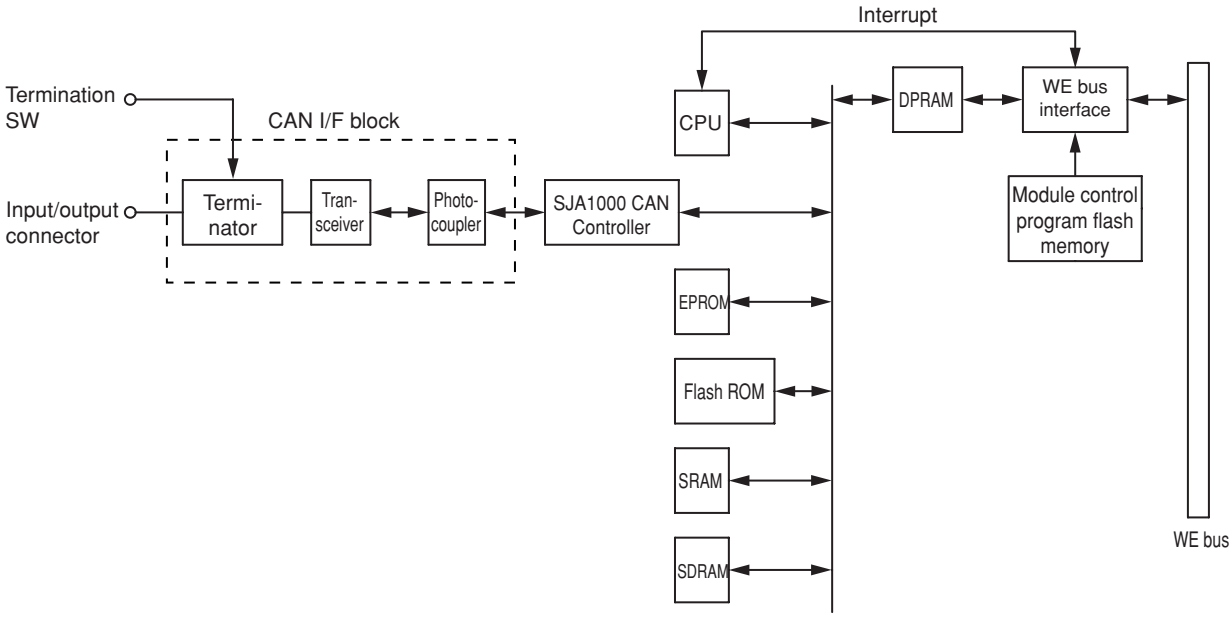
1.1 System Configuration, Block Diagram, Frame Types and Format, and Operation Panel

System Configuration

The following is an example in which the WE7081 CAN BUS INTERFACE Module is installed into the measuring station and the measuring station is connected to the PC with the optical fiber cable.



Block Diagram



Description of Operation

This modules is connected to a CAN Bus conforming to ISO-11898 as a single node. It can read the data frames that flow through the CAN Bus and output data frames and remote frames to the CAN Bus.

The module receives frames by reading the frames transmitted by other nodes through the input/output connector (D-Sub 9 pin). If the frame is a data frame, it is retrieved using the CAN controller (SJA1000) by Philips that is isolated using a photocoupler in the CAN I/F block. The data frame is then written to the temporary buffer on the SRAM. As necessary, the data in the temporary buffer is re-sampled using a clock of a constant period and stored in the data memory within the SDRAM.

The module transmits frames by downloading the transmission data frame or remote frame that is defined at the software level to the SDRAM via the DPRAM and passing the frame to the CAN controller (SJA1000). The module is capable of transmitting remote frames while acquiring data.

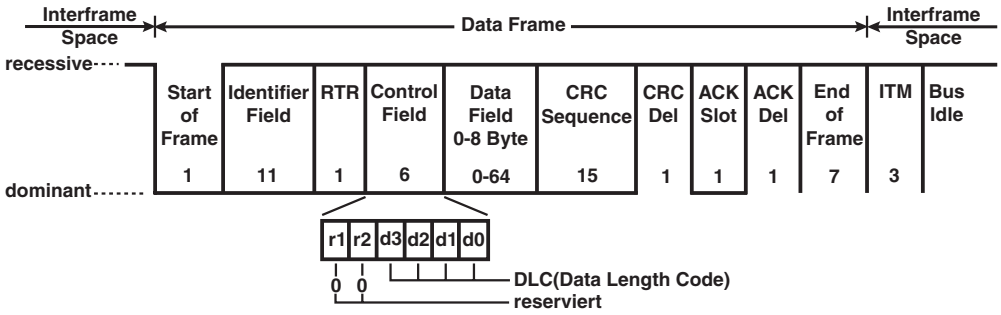
The module is characterized by a local CPU that is dedicated to transmitting/receiving data to/from the CAN bus via the DPRAM and controlling the system according to the WE7000 firmware. The CPU runs according to the firmware in the flash ROM and issues CAN Bus input/output instructions to the controller. It also controls the functions to the left of the DPRAM in the above figure such as communicating with the WE7000 main CPU through the interface consisting of the DPRAM and interrupt signals.

Frame Types

The WE7081 handles the following three types of frames.

Data Frame

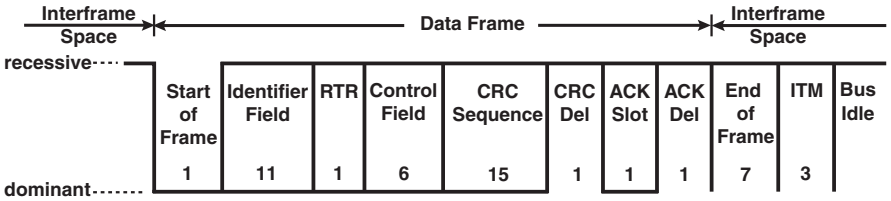
Frame used to transmit data on the CAN Bus. The figure below shows structure of the data frame.



Remote Frame

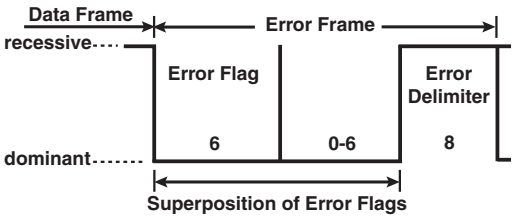
Frame used by the transmitter node to request data corresponding to the specified message ID to other nodes. On the WE7081, remote frames can be issued for each message ID to request data.

The remote frame format conforms to the data frame but there is no data field.



Error Frame

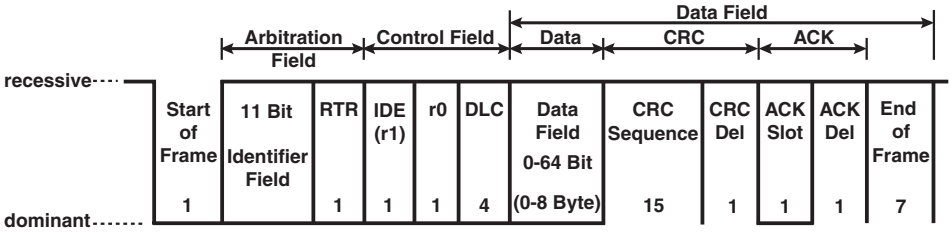
Frame generated when an error is detected on the CAN Bus. On the WE7081, the error indicator on the front panel illuminates when an error frame is detected.



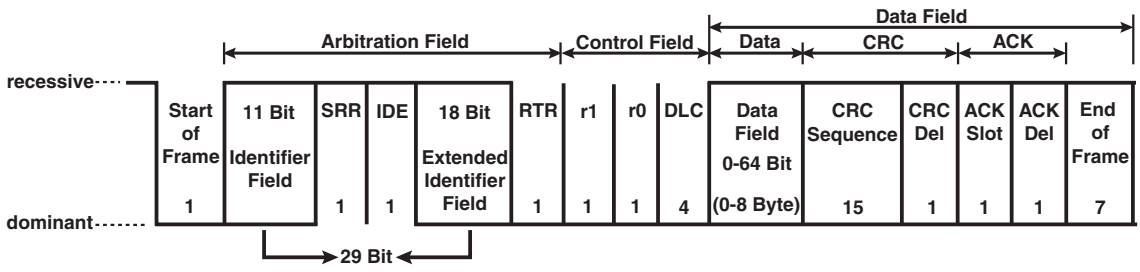
Frame Format

The WE7081 supports both the standard and extended formats.

Standard Format



Extended Format



Operation Panel

The WE7000 Control Software that is installed in the PC is used to control the WE7081 CAN BUS INTERFACE Module. The WE7000 Control Software displays operation panels similar to those shown in sections 1.3 to 1.6. This user's manual does not explain the operations of the operation panel or waveform monitor. For the operations of these items, see the on-line help that is provided with the WE7000 Control Software.

1.2 Operation Modes and Common Settings

Operation Modes

The WE7081 has the following four operation modes for you to choose from.

Data Block Signal Acquisition/Frame Output Mode (Acquisition)
Acquires a specified block (data block) of the data field defined as channel setting information from the data frame flowing on the CAN Bus and resamples and converts the data to time-series data. The CANdb database file from Vector Informatik can also be used to define the CAN data.
Like the digitizer module, this module can perform free-run measurement and trigger measurement. The acquired data can be displayed on the waveform monitor on the PC, the instantaneous values can be displayed, and the data can be saved to files. In addition, you can specify multiple data frames to be output periodically, when triggers are detected, when remote frames are received, or at an arbitrary time. Furthermore, the data frames can be output according to a predefined sequence.

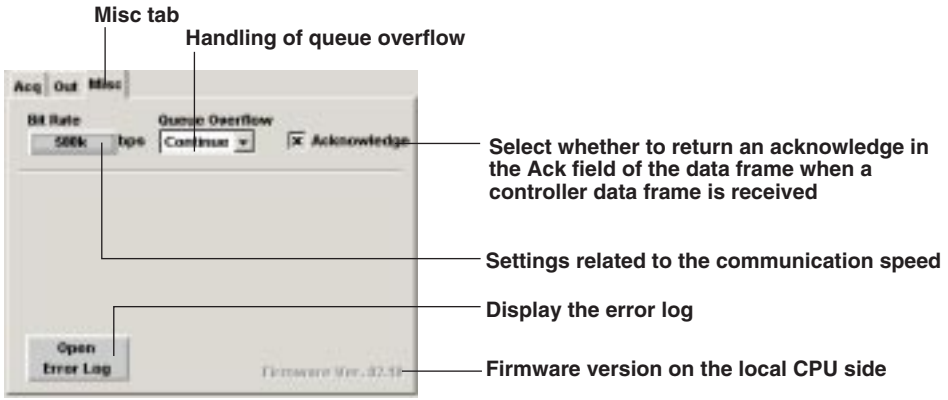
Data Frame Acquisition Mode (Frame Acquisition)
Receives data frames flowing on the CAN Bus and stores them along with the reception time information indicating the time elapsed since the trigger was detected and acquisition was started. The resolution is 100 μs. You can limit the received frames using an ID filter, specify the number of data frames to be acquired, and save the data stored to the memory to a WCF binary file (.wcf) or ASCII data file in CSV format (.csv) on the PC.
The saved data can be output on the CAN Bus using the frame output mode.

Data Block Signal Output Mode (Output)
Combines data frames by the ID according to the conditions defined as channel setting information and outputs the data periodically on the CAN Bus. The data block to be output can be swept in a ramp or triangular shape with time.

Data Frame Output Mode (Frame Output)
Loads the frame data file in WCF or CSV format from the PC and transmits the data frames on the CAN Bus. You can specify the repetition count for outputting the loaded data frame. Trigger detection can be used to control the output timing.

Settings Common to All Operation Modes

The following common setup conditions are displayed when you click the MISC tab in each operation mode. Set these items before starting the acquisition and output of data blocks.

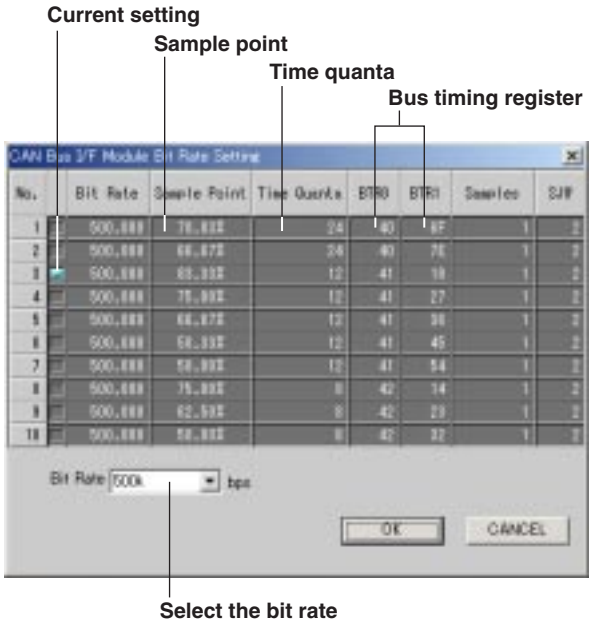


Settings Related to the Communication Speed

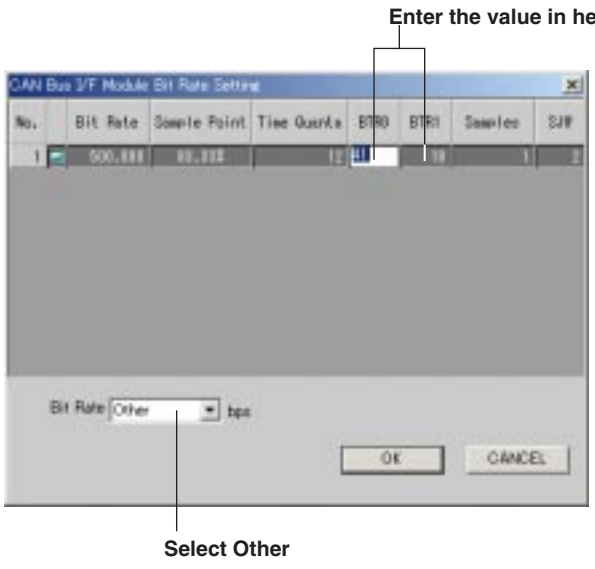
Set the bit rate that defines the communication speed, the sample point that sets the acquired bus level to be the bit value, and the time quanta that indicates the sampling interval. The time quanta is automatically set when you select the sample point.

The current bit rate setting is displayed above the Bit Rate button. To change the bit rate, click the **Bit Rate** button and choose from 10k, 20k, 33.3k, 50k, 62.5k, 83.3k, 125k, 250k, 500k, 800k, 1Mbps, and Other on the bit rate setup screen. The default setting is 500 kbps.

When you select the bit rate, the selectable sample points and time quanta corresponding to the bit rate are displayed (see appendix 1, “Sample Point Table”). The check box of the No. corresponding to the default sample point setting of each bit rate is selected. To set a different sample point, select the No. check box displaying the desired sample point.



If you select Other, you can set the two bus timing registers BTR0 and BTR1 directly, and arbitrarily set the bit rate, sample point, time quanta, the number of sample points, and SJW (Synchronization Jump Width). The selectable range of BTR0 and BTR1 is 00 to FF in hexadecimal notation. The default setting is 41 and 18 for BTR0 and BTR1, respectively.



The definition of BTR0 and BTR1 conforms to the specifications of the Philips SJA1000 CAN Controller. The following description is based on the data sheet of the SJA1000 CAN Controller.

BTR0 (Bus Timing Register 0)

BTR0 determines the BRP (Bit Rate Prescaler) and SJW (Synchronization Jump Width) using the following bit assignments.

BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
SJW.1	SJW.0	BRP.5	BRP.4	BRP.3	BRP.2	BRP.1	BRP.0

- BRP(Baud Rate Prescaler)
  The CAN system clock cycle tscl is variable. It determines the bit timing.
  The CAN system clock cycle tscl is derived from the following equation.
  tscl =2 * tCLK * (32 * BRP.5+16 * BRP.4+8 * BRP.3+4 * BRP.2+2 * BRP.1 * BRP.0+1)
  where tCLK is the WE7081 internal clock cycle which is equal to 1/XTAL=1/24000000.
- SJW (Synchronization Jump Width)
  Re-synchronization of signals is carried out to correct the clock phase shifts of bus controllers of other nodes connected to the same bus.
  When carrying out re-synchronization, the maximum clock cycles in a bit period is actually longer or shorter than the setting. To correct this difference, you set tSJW (Synchronization Jump Width). The variable tSJW is derived from the following equation.
  tSJW =tscl * (2 * SJW.1 +SJW.0 +1)

BTR1 (Bus Timing Register 1)

BTR1 defines the two time segment lengths within a bit period, sample point, and the number of samples using the following bit assignments.

BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
SAM	TSEG2.2	TSEG2.1	TSEG2.0	TSEG1.3	TSEG1.2	TSEG1.1	TSEG1.0

- SAM (Sampling)
  When SAM = 1, the bus is sampled three times. It is recommended for low/medium speed buses.
  When SAM = 0, the bus is sampled once. It is recommended for high speed buses.
- TSEG1 (Time Segment 1) and TSEG2 (Time Segment 2)
  TSEG1 and TSEG2 determine the number of clock samples per bit period and the sample point.
  tSYNCSEG =1 * tscl[s]
  tTSEG1 =tscl * (8 * TSEG1.3 + 4 * TSEG1.2 + 2 * TSEG1.1 + TSEG1.0 + 1)[s]
  tTSEG2 =tscl * (4 * TSEG2.2 + 2 * TSEG2.1 + TSEG2.0 + 1)[s]
  As a result, the bit rate is also determined as indicated by the following equation.
  Bit rate =1/(tSYNCSEG + tTSEG1 + tTSEG2)[bps]

Handling When the Queue Overflows (Queue Overflow)

If you select Continue, acquisition or output continues even if the data acquisition or output queue buffer overflows. In this case, the operation continues, but data dropout occurs in the acquisition or output.

If you select Stop, acquisition or output stops when the data acquisition or output queue buffer overflows.

Acknowledge

Selects whether the controller returns an acknowledge in the Ack field of the data frame when data frames are received in data block signal acquisition/frame output mode and data frame acquisition mode (Frame Acquisition). In general, acknowledge is returned when used as a virtual node and not returned when used as a bus monitor. If acknowledge is not returned, remote frame output and frame output do not work. The default setting is to return acknowledges.

This check box is used to select whether frames are retransmitted (check box selected) or not retransmitted (check box not selected) when an acknowledge is not received in data block signal output mode (Output) and data frame output mode (Frame Output). The default setting is to retransmit the frame.

Displaying the Error Log

Lists the log of errors that the controller detected. If you click the Open Error Log button, a separate dialog box displaying the error log opens.

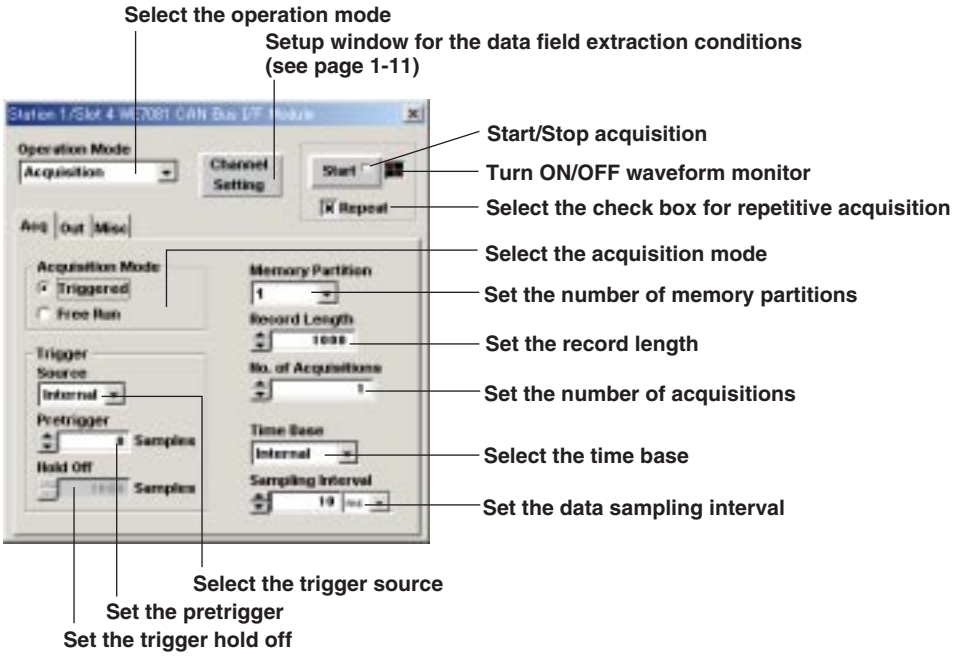
The dialog box shows the newest 64 errors at the time the dialog box was opened. The errors before those shown on the log do not remain. In addition, the log that is displayed is cleared when you close the dialog box. For details on the error codes, see appendix 3, “Error Codes.”

Firmware Version (Ver.XX.XX) on the Local CPU Side

Displays the firmware version number on the local CPU side.

1.3 Data Block Signal Acquisition/Frame Output Mode (Acquisition)

Operation Panel



Selecting the (Operation Mode)

Select **Acquisition**.

Start/Stop Data Acquisition

Click the **Start** button to start data acquisition according to the specified acquisition mode. If you select the Repeat check box*, acquisition continues until you press the Start button again.

* The Repeat check box appears only when you set the acquisition mode to Triggered, and the number of acquisitions to 1.

Acquisition Mode

Select either of the following.

Trigger Mode (Triggered)

Acquires data to the data memory according to the specified trigger conditions (see the next page) and stops the operation when the specified record length of data is acquired. In this mode, the data memory can be partitioned and the data can be written to the individual memory blocks each time a trigger occurs. If you set the number of acquisitions (see the next page) to 1 and select the Repeat check box, the same operation is repeated until you click the Start button again. However, if the record length is set to a value greater than 4,194,304/the number of channels/data size, measurements cannot be repeated.

Free Run Mode (Free Run)

Acquisition of the data starts immediately upon starting the measurement. The operation stops when the measurement is stopped.

Trigger Setting (only when the acquisition mode is set to Trigger)

Trigger Source (Source)

Select the trigger source signal from the following:

Internal: Trigger is activated according to the trigger condition of each channel specified on the channel setting panel.

BUSTRG: Bus signal (BUSTRG1/BUSTRG2) of the WE bus

Pretrigger

The data before the trigger point can be acquired to the data memory. Set how many points before the trigger point to begin the acquisition in the range, “0 to the specified record length – 2.”

Trigger Hold Off

If the number of acquisitions is set to value greater than or equal to 2, you can specify the trigger hold off period that is used to temporarily stop the detection of the next trigger once a trigger occurs. Enter the number of samples for the hold off period in the Hold Off box. The hold off period can be set in the range of “the record length to 8,388,608” (data points).

Data Acquisition Condition

Memory Partition (only in trigger mode)

You can divide the data memory into multiple blocks and acquire the data to the memory blocks in order every time the trigger occurs. You can divide the memory into 1, 2, 4, 8, 16, 32, 64, 128, or 256 partitions.

Record Length (only in trigger mode)

The number of data points acquired in the data memory is called the record length. The selectable range is “100 to 8,388,608/(the number of acquisition channels × acquisition data size × the number of memory partitions)” points. The maximum selectable number of points when data is repetitively acquired by selecting the Repeat check box is “4,194,304/(the number of memory partitions) × the number of acquisition channels)/ acquisition data size)” points.

No. of Acquisitions (only in trigger mode)

Set the number of times to carry out data acquisition. The selectable range is 1 to 2,147,483,647 times. However, repeat is possible only when the number of acquisitions is 1. In addition, even if the number of acquisitions is “1”, but the record length is set to a value greater than or equal to “4,194,304/the number of channels/data size,” repeat is not possible.

Time Base

Select whether to sample the input signal with the specified sampling interval based on the module’s internal clock or to sample with the time base signal of the measuring station.

Internal: Internal clock

BUSCLK: Input signal (CMNCLK) according to the trigger source/time base source/ arming setting (see section 4.6, “Setting Trigger Source/Time Base Source/ Arming” in the WE7000 User’s Manual (IM707001-01E)).

Data Sampling interval (Sampling Interval)

Set the interval at which data is acquired to the data memory. The selectable range is 1 ms to 10 s in steps of 1 ms.

Note

In some cases, the module may not operate properly even if the data sampling interval is within the selectable range. For example, there is a tendency for the module to not operate properly when the number of data acquisition channels or remote frame output channels is large. In such case, set the data sampling interval according to the following guideline. The guideline does not guarantee the operation. Change the interval as necessary.
In free run mode, the minimum data sampling interval that can be specified may be larger than the value indicated below depending on the PC performance and the load conditions of the communication path. The values indicated below are reference values when the WE7052 fast Ethernet communication is used on a PC with Pentium III 500 MHz running Windows 2000.

	When in Trigger Mode	When in Free Run Mode
When the number of channels is 16 or less	1 ms to 10 s	1 ms to 10 s
When the number of channels is between 17 and 32	2 ms to 10 s	4 ms to 10 s
When the number of channels is between 33 and 64	4 ms to 10 s	8 ms to 10 s

Data Field Extraction Conditions (Channel Setting)

On the WE7081, the extraction method of a specified section of the data field (CAN data) of the data frame flowing on the CAN Bus is defined on the channel setup window. The definition of up to 64 channels can be specified as a channel.
If the data field contains two data sequences as shown in the following figure, this means that a single data frame contains two channels of data.

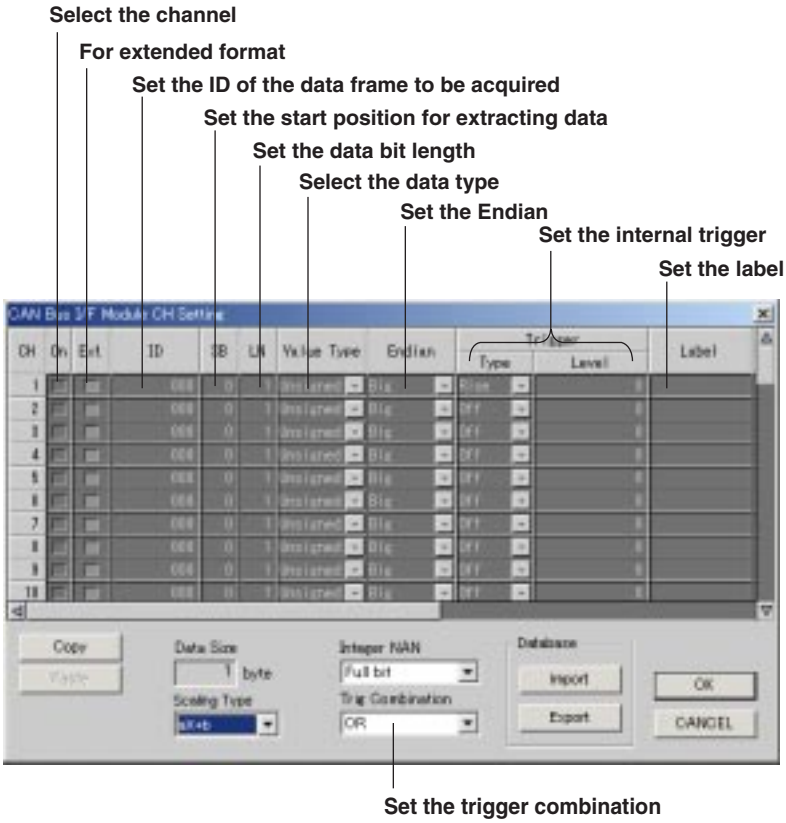
Start Bit = 0, Length = 16 bit → 2-byte integer (CH1)
Start Bit = 32, Length = 32 bit → 4-byte floating point (CH2)

Note

The WE7081 does not support the Forward format by Motorola.

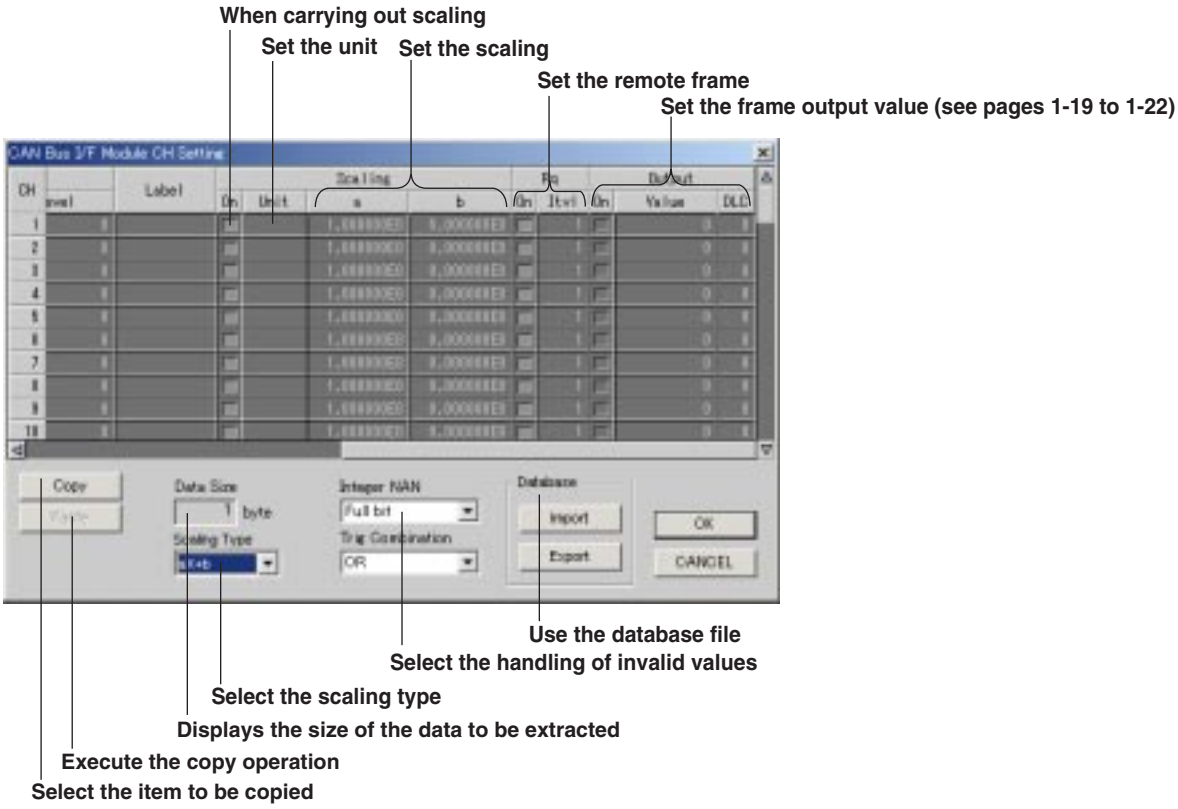
Click **Channel Setting** to define the data block to be extracted and set the internal trigger, alarm, and other settings.

- **When in trigger mode**



- **When in free run mode**

- **Section common to trigger mode and free run mode**



Turn ON/OFF the Acquisition Channel (On)
Select the check boxes for the channels you wish to acquire data.

Data Frame Format (Ext)
Select the check box when setting the data frame to be acquired to the extended format. Otherwise, the data frame is set to the standard format.

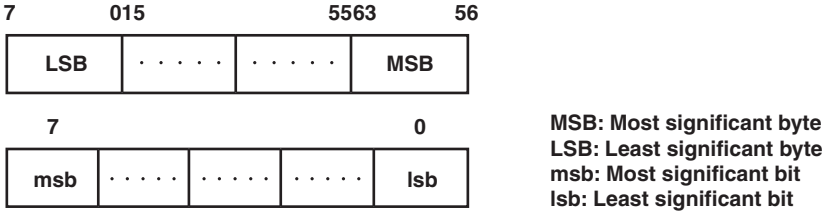
Message ID (ID)
Set the ID of the data frame to be acquired. For extended format, the selectable range is 0 to 0×1FFFFFFF (29 bits). For standard format, the selectable range is 0 to 0×7FF (11 bits).

Data Extraction Position (SB)
Set the data position of the data frame to start extracting using a bit number. The selectable range is from 0 to 63.

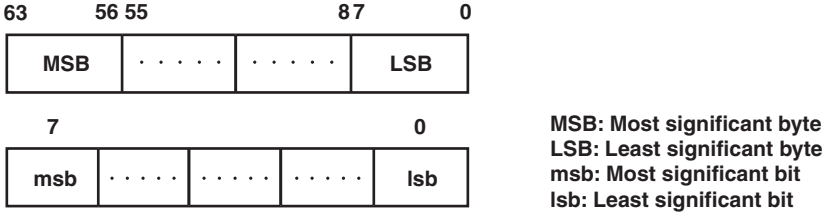
Bit Length (LN)
Set the bit length of data block to be extracted. The selectable range is from 1 to 64.

Data Type (Value Type)
Select the type for handling the extracted CAN data from the following.
Unsigned (Unsigned Integer) type
Signed(Signed Integer) type
Float type
If you select Float, the only selectable bit lengths are 32 and 64.

Endian
Select the format when storing the data block of the data frame to the memory.
Little: The bit number increases to the left at the bit level and to the right at the byte level starting with the lsb of the LSB of the beginning of the data frame.



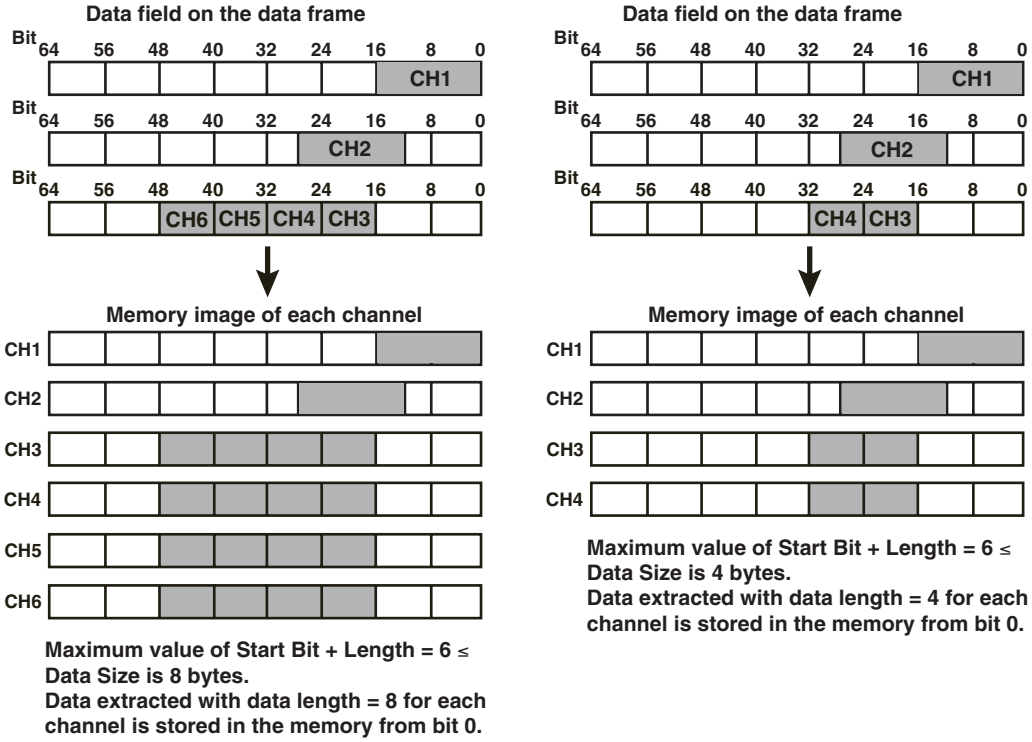
Big: The bit number increases to the left at the bit level and to the right at the byte level starting with the lsb of the LSB of the end of the data frame.



The output position and bit length of the data block are set using a sequence of bit numbers as shown above.

Acquisition Data Size (Data Size)

Displays the data with the largest bit length from the extracted data of each channel. The acquired data block is stored to the memory according to the size displayed here to each channel.



The relationship between the bit length and the acquired data size is as follows.

Bit Length	Acquisition Data Size
1 to 8	1 byte
9 to 16	2 bytes
17 to 32	4 bytes
32 to 64	8 bytes

Invalid Value (Integer NAN)

If data of unreceived data frame occurs, the data is handled as a NAN (Not-A-Number) data. Select how to handle the NAN data when the data type (Value Type) is unsigned or signed.

Fullbit: NAN data is set to “0×FF...F,” and the acquired data is not displayed on the graph.

Zero(0): NAN data is set to “0,” and the acquired data is displayed on the graph as 0.

If data type is set to float, the data is set to 0×FF...FF, and the acquired data is not displayed on the graph.

Internal Trigger Setting (Trigger) (only when the acquisition mode is set to Triggered)

When the acquisition mode is set to Triggered, the data trigger of each channel can be used as an internal trigger. The conditions for trigger detection are set for each channel. The detected triggers can be output to the WE bus BUSTRG or notified as events to the PC.

- **Trigger Type**

  If the trigger source is set to Internal, you can select the trigger type for each channel.

  Rise: A trigger is activated when the readout signal changes from below the trigger level to above the trigger level (edge trigger).

  Fall: A trigger is activated when the readout signal changes from above the trigger level to below the trigger level (edge trigger).

  Both: Both rising and falling (edge trigger)

  High: A trigger is activated when the readout signal is greater than or equal to the specified trigger level or when it enters that condition (state trigger).

  Low: A trigger is activated when the readout signal is less than or equal to the specified trigger level or when it enters that condition (state trigger).

  X: A trigger is activated when the data frame of the message ID of the acquisition channel specified in advance is received. When this setting is used, you cannot set the trigger level.

  Off: Trigger detection is not performed.

- **Trigger Level**

  You can set the trigger level when the trigger source is set to internal and the trigger type is set to a value other than X or Off. The selectable range varies depending on the data type (Value Type) selection.

  - When the data type is unsigned and scaling is not used
    0 to 2^{N}–1 (where N is the bit length (LN))
  - When the data type is signed and scaling is not used
    -2^{N-1} to 2^{N-1}–1 (where N is the bit length (LN))
  - When the data type is float or when scaling is used
    –3,40282E38 to 3,40282E38

- **Trig Combination**

  Selects the logic between channels.

  OR trigger: A trigger is activated if any one of the trigger conditions specified for the input signal of each channel is met.

  AND trigger: A trigger is activated when all of the trigger conditions specified for the input signal of each channel are met.

Alarm Setting (Alarm) (only when the acquisition mode is set to free run)

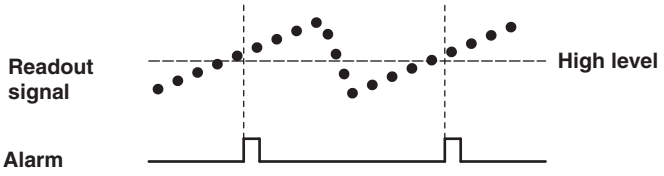
When the acquisition mode is set to free run, the alarm activated status can be output to the BUSTRG1/BUSTRG2 bus in the measuring station as a bus trigger signal.

- Alarm Type

  You can select the alarm type from the following:

  Off: Do not detect alarms.

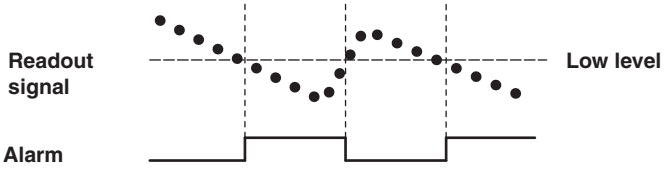
  Rise: Output when the readout signal changes from a value less than the specified upper limit to a value greater than the specified upper limit.



  Fall: Output when the readout signal changes from a value exceeding the specified lower limit to a value less than the lower limit.

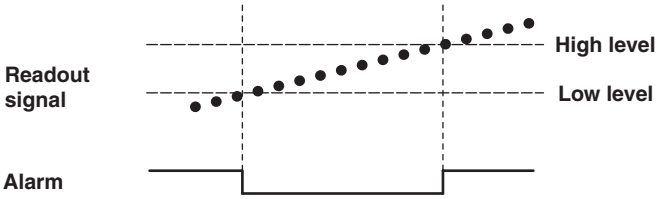
  High: Output when the readout signal is greater than or equal to the specified upper limit.

  Low: Output when the readout signal is less than or equal to the specified lower limit.



  In: Output when the readout signal is within the specified upper and lower limits.

  Out: Output when the readout signal is less than the specified lower limit or greater than the specified upper limit.



- Alarm High

  Set the threshold level when alarm type is set to Rise, High, In, or Out.

  - When the data type is unsigned and scaling is not used
    0 to 2^N–1 (where N is the bit length (LN))
  - When the data type is signed and scaling is not used
    -2^{N-1} to 2^{N-1}–1 (where N is the bit length (LN))
  - When the data type is float or when scaling is used
    –3,40282E38 to 3,40282E38

Note

If this value is set to a value smaller than Alarm Low, Alarm Low is set equal to the specified Alarm High value.

- Alarm Low
  Set the threshold level when alarm type is set to Rise, High, In, or Out.
  - When the data type is unsigned and scaling is not used
    0 to 2^N–1 (where N is the bit length (LN))
  - When the data type is signed and scaling is not used
    -2^{N-1} to 2^{N-1}–1(where N is the bit length (LN))
  - When the data type is float or when scaling is used
    –3,40282E38 to 3,40282E38

Note

If this value is set to a value larger than Alarm High, Alarm High is set equal to the specified Alarm Low value.

Label

You can assign labels to each channel. When the acquisition or output channel is ON, enter the label using up to 31 characters.

Scaling

You can linearly convert the measured values to arbitrary physical values.

On: Select the check box when carrying out linear scaling.

Unit: Set the physical unit after linear scaling.

Scaling Type

Select either of the following. A channel setup window corresponding to the selected type appears.

P1-P2: Set the measured values at any two points (VP1 and VP2) and their corresponding physical values (SP1 and SP2). The values at these four points define the scale converting equation (Y = aX + b).

aX+b: Set the scaling coefficient (a) and offset value (b) to define the scale conversion equation (Y = aX + b)

The scaling setting of the channel setup window is synchronized to the WE7000 Control Software. For details on setting the scale, “Convert Scale” in section 4.4, “Station List Window Operations” in the WE7000 User’s Manual (IM707001-01E).

Remote Frame Output ON/OFF and Output Interval (Rq)

The remote frame of the message ID of the data acquisition channel can be output at an integer multiple of the data sampling interval.

On: Select the check boxes for the channels you wish to output the remote frames. You cannot select the check box on channels whose data acquisition is turned OFF.

Intvl: Set the output interval in the range of 1 to 9999.

Note

Channels whose message ID are the same are set to the same setting.

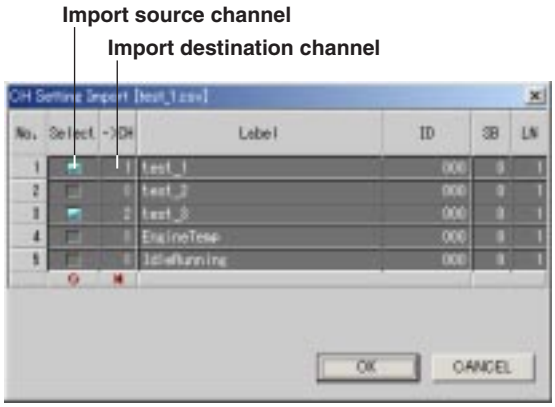
Using the Database File (Database)

The target information from a database file containing data extraction definition can be set to the setup data of a specified channel. In addition, the extraction information defined in the channel setup of the WE7081 can be saved as a database.
The file formats that can be used are the following two types.

dbc format: CANdb or CANdb++ signal definition data base by Vector Informatik. Can be used as a channel setting definition of the WE7081. This is a read-only file format.

CSV format: The channel setting definition of the WE7081 can be saved as a database to a text file in CSV format. The saved data can be edited using Excel or a text editor.

- Importing the Extraction Definition Information (Import)
  1. Click **Import** to open a dialog box for selecting the import file.
  2. Select the file to be imported in the dialog box and click **Open** to open the import dialog box.
  3. If the file to be imported is in .dbc format, select the network node to be displayed as necessary.



  4. In the import dialog box, select the check boxes for the items to be imported and the channel number to which the item is to be imported.
  5. Click **OK** to import the data of the selected items.

- Exporting the Channel Setting Definition to a Database (Export)
  1. Click **Export** to open a dialog box for selecting the export file.
  2. Enter the name of the destination file, select the data format of the file, and click **Save** to save the information.

Copying/Pasting Channel Settings

The setup information of each channel can be copied to other channels. Click a channel number and click the **Copy** button to copy the setup information temporarily in the memory. Click the copy destination channel number and click the **Paste** button to display the dialog box shown below. Check the setup information to be copied and clear the check box for items that do not need to be copied. Click **OK** to complete the copy operation.

Frame Output Function

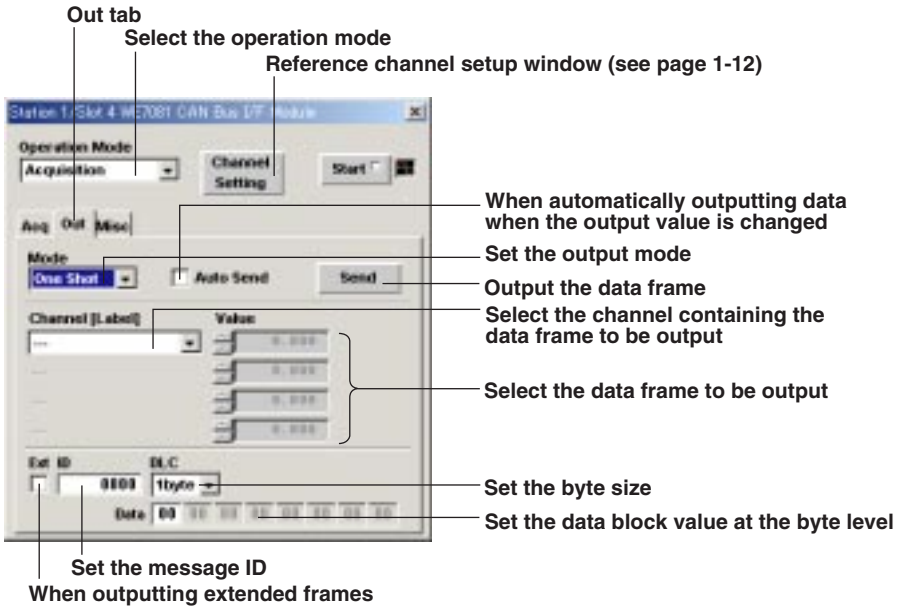
Click the **Out** tab to display the frame output setup screen, which operates independently from the data block signal acquisition. The following six output modes are available.

- One shot output mode (One Shot)
- Manual output mode (Manual)
- Periodic output mode (Periodic)
- Trigger synchronization output mode (Triggered)
- Remote frame synchronization output mode (Remote)
- Sequence output mode (Sequential)

In the Manual, Periodic, Triggered, and Remote modes, the output value (physical value) of the channel whose output is turned ON is expanded to the data block according to the scale information and extraction definition and output. If multiple channels are defined to the same message ID, the channels are combined to create a single data frame. In addition, in output modes other than Remote mode, when output is turned ON for multiple message IDs, all the data frames that are turned ON are output at once. The output timing varies in each mode.

One Shot Output Mode (One Shot)

Outputs a single frame of a specified data frame or remote frame at a specified timing. The frame can also be output automatically when the data value is changed. The frame to be output can be referred from a channel defined in the channel setup window or a new frame can be defined.



1. Select One Shot from the **Mode** list box.

- When referring to a channel defined in the channel setup window

2. Click the **Channel Setting** button to display the channel setup window. Set the definition of the output channel in Output.

   On: Select the check boxes for the channels you wish to output.
   When the output is turned ON, the output of other channels with the same message ID is also automatically turned ON. Acquisition turns OFF on channels whose output is turned ON. The number of channels that can be turned ON simultaneously is 30, and the number of message ID is 10. If you attempt to output frames exceeding the number limit of channels and message IDs, an error message is displayed.

   Value: Set the value of the data frame to be output. This value is synchronized to Value on the Out tab screen.

   DLC: Set the byte size of the data block of the data frame. The selectable range is from 1 to 8.

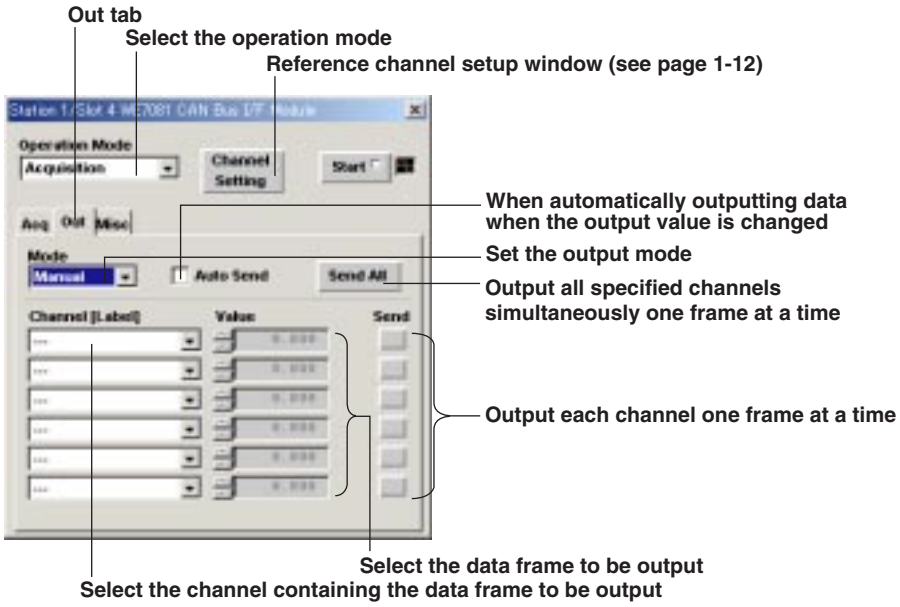
3. Click the **OK** button to close channel setup window.
4. Select the channels containing the data frame to be output from the **Channel [Label]** list box. The definition of the data frame to be output is displayed at the lower section of the panel. If a label is defined for the channel, the label is displayed. If there are channels that have the same message ID defined as the selected channel, up to three of those channels are displayed automatically. If there are more than three channels that have the same message ID defined, the three smallest channels following the selected channel are displayed in ascending order.
5. Set the output value in **Value** using a physical value.

- When defining a new frame

6. Set the following items.
   - Ext: Select the check box when outputting an extended frame.
   - ID: Set the message ID. When the data frame is in the standard format, the selectable range is 0 to 0×7FF (11 bits). When the data frame is in the extended format, the selectable range is 0 to 0×1FFFFFFF (29 bits).
   - DLC: Select the byte size of the data block of the data frame in the range of 1 byte to 8 bytes. If you select R0, a remote frame is output.
   - Data: Set the value of the data block of the data frame in unit of bytes using hexadecimal notation.
7. Click **Send** to output the data frame. To output the data frame automatically when the output value is changed, select the **Auto Send** check box.

Manual Output Mode (Manual)

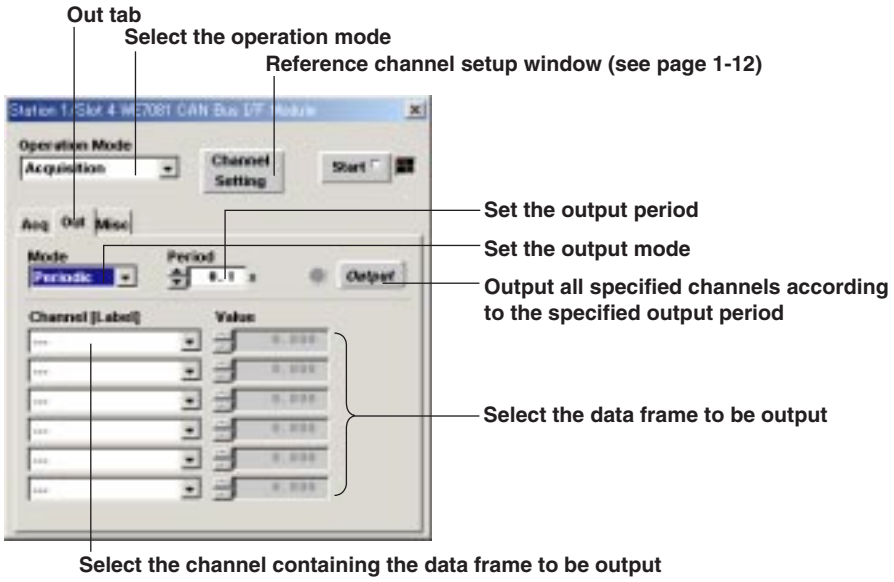
Outputs the data frame once at a specified timing. Like the one shot output mode, the data frame can be output automatically when the data value is changed.



1. Select Manual from the **Mode** list box.
2. Carry out steps 2 and 3 of the procedure for the one shot output mode.
3. Select the channels containing the data frame to be output from the **Channel [Label]** list box. If a label is defined for the channel, the label is displayed.
4. Set the output value in **Value** using a physical value.
5. Click **Send** to output one frame at a time on each channel. Click **Send All** to output one frame at a time on all channels simultaneously. To output the data frame automatically when the output value is changed, select the **Auto Send** check box.

Periodic Output Mode (Periodic)

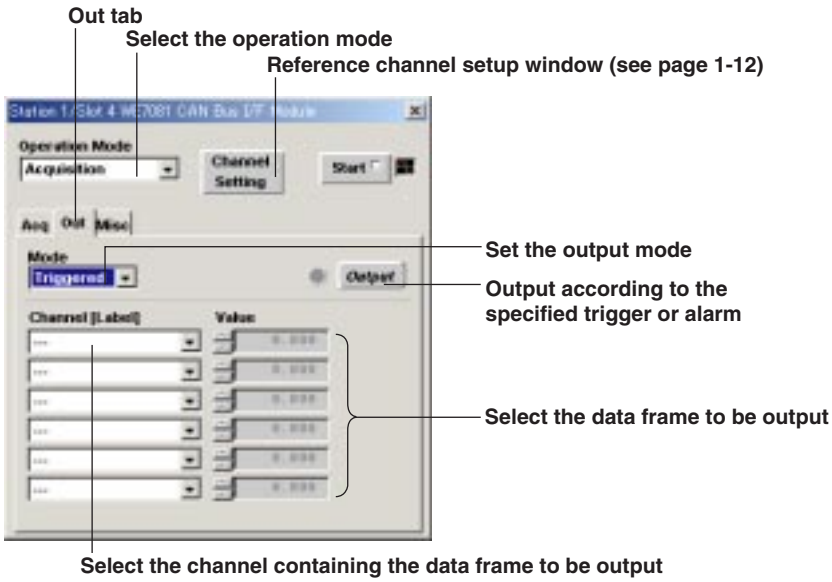
Outputs data frames repetitively at a specified output period.



1. Select Periodic from the **Mode** list box.
2. Carry out steps 2 and 3 of the procedure for the one shot output mode.
3. Select the channels containing the data frame to be output from the **Channel [Label]** list box. If a label is defined for the channel, the label is displayed.
4. Set the output value in **Value** using a physical value.
5. Set the output period in the **Period** box. The selectable range is 0.1 s to 1000 s (0.1 s steps).
6. Click **Output** to output the data frame.

Trigger Synchronization Output Mode (Triggered)

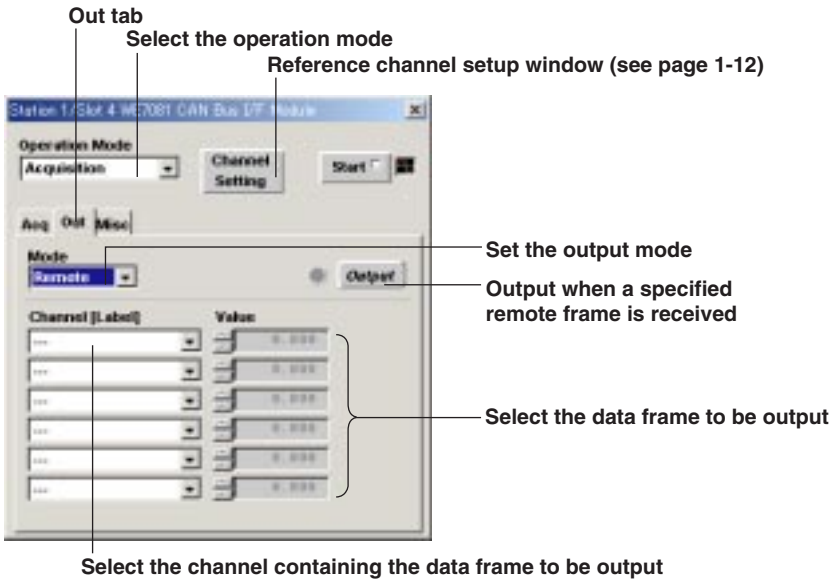
Outputs the data frame when a trigger or an alarm is detected.



1. Select Triggered from the **Mode** list box.
2. Carry out steps 2 and 3 of the procedure for the one shot output mode.
3. Select the channels containing the data frame to be output from the **Channel [Label]** list box. If a label is defined for the channel, the label is displayed.
4. Set the output value in **Value** using a physical value.
5. Click **Output** to output the data frame.

Remote Frame Synchronization Output Mode (Remote)

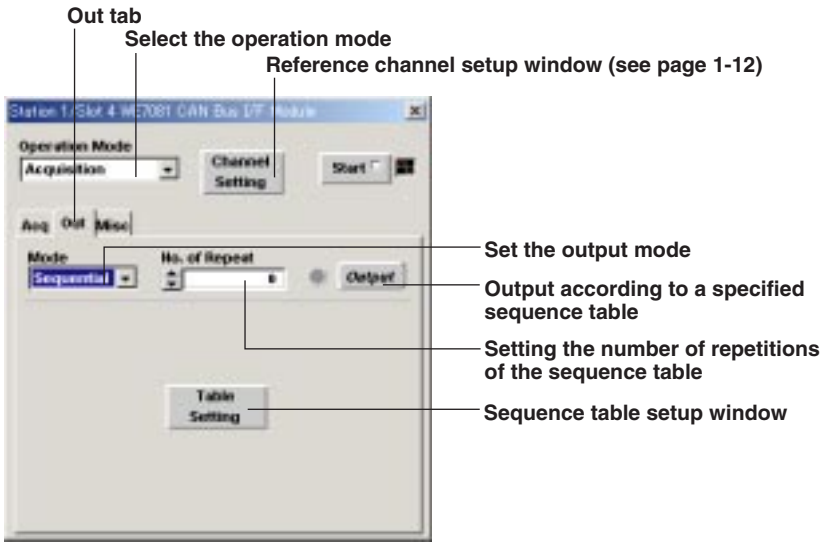
Outputs the data frame when a remote frame corresponding to a specified frame is received.



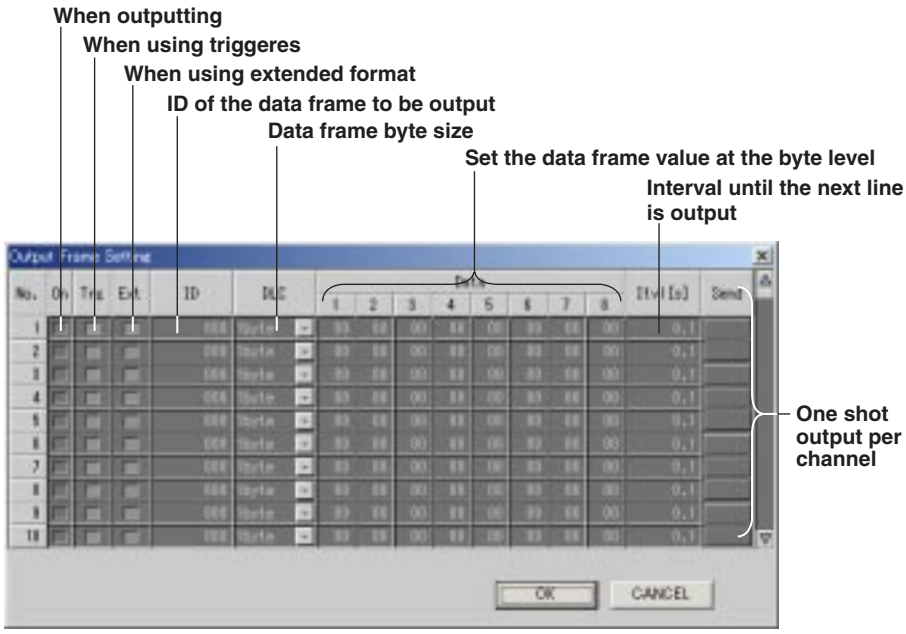
1. Select Remote from the **Mode** list box.
2. Carry out steps 2 and 3 of the procedure for the one shot output mode.
3. Select the channels containing the remote frame to be output from the **Channel [Label]** list box. If a label is defined for the channel, the label is displayed.
4. Set the output value in **Value** using a physical value.
5. Click **Output** to output the data frame.

Sequence Output Mode (Sequential)

Outputs the frames according to a sequence table created in advance. You can specify the number of times to repeat the sequence table.



1. Select Sequential from the **Mode** list box.
2. Click **Table Setting** to show the sequence table. The data frame can be output one line at a time according to the setting on this table. Up to 1024 lines can be specified on the sequence table.



On: Select the check boxes for the line numbers you wish to output.

Trig: Select the check boxes for the line numbers you wish to output when triggers are detected.

Ext: Select this check box to set the ID of the output data frame to extended format. Otherwise, the data frame is set to the standard format.

ID: Set the ID of the data frame to be output. For extended format, the selectable range is 0 to 0×1FFFFFFF (29 bits). For standard format, the selectable range is 0 to 0×7FF (11 bits).

DLC: Select the byte size of the data block of the data frame in the range of 1 byte to 8 bytes.

Data: Set the value of the data frame corresponding to the byte size specified by DLC in unit of bytes using hexadecimal notation.

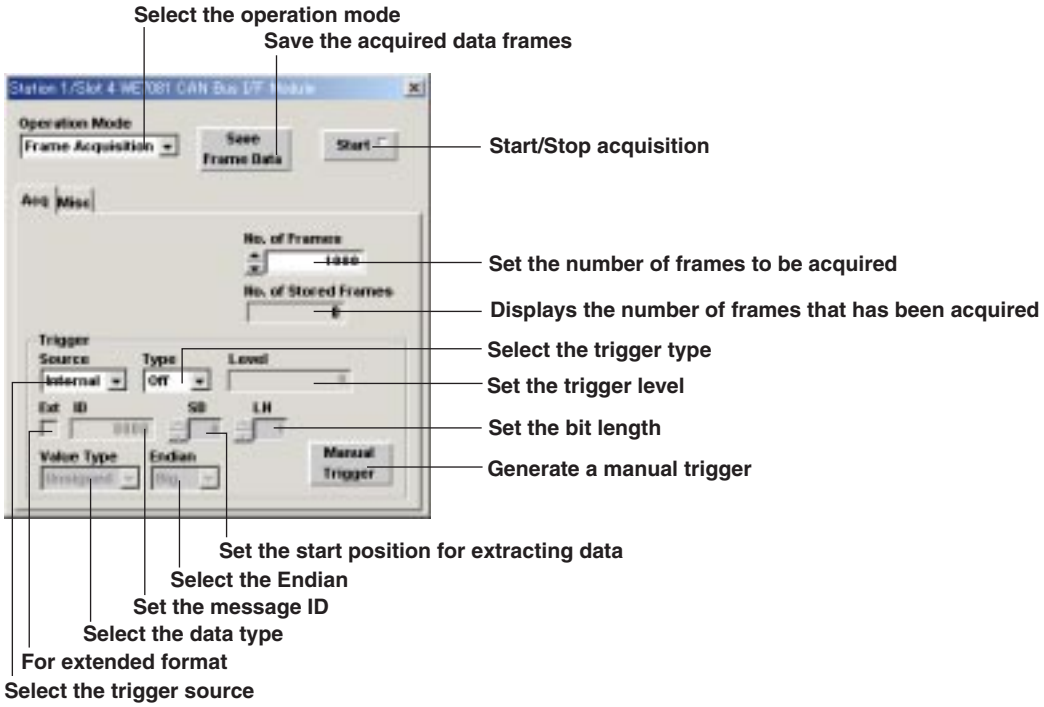
Invl[s]: Set the time until the next line is output. The selectable range is 0.1 s to 100 s (0.1 s steps).

Send: Click to output one shot on the channel.

3. Click **OK**.
4. Set the number of times to output the sequence table in the **No. of Repeat box**. The selectable range is from 0 to 2,147,483,647. If you set the value to 0, the output is repeated infinitely.
5. Click **Output** to output the data frame.

1.4 Data Frame Acquisition Mode (Frame Acquisition)

Operation Panel



Selecting the (Operation Mode

Select **Frame Acquisition**.

Starting/Stopping Acquisition

Click the **Start** button to enter the trigger-wait state. When the trigger is activated, acquisition starts. When you click the Start button, you can no longer operate the setup items on the operation panel and all the buttons other than the Start button. Data frame acquisition continues until the specified number of times the data frames are acquired or until the Start button is clicked again.

Setting the Acquisition Conditions

Setting the Number of Acquired Frames (No. of Frames)

Set the number of data frames to be acquired in the range of 0 or 1 to 2,147,483,647. However, if you set the number of frames to 419430 or greater, only the newest 410430 frames are retained. If you set the value to 0, the module acquires data frames from the time the Start button is clicked until the acquisition is stopped. If you set a value other than 0, the module acquires data frames until the specified number of frames is acquired or from the time the Start button is clicked until the acquisition is stopped. The data frames in the internal memory are acquired in order from the oldest to the newest data frame. Data frames that overflow from the memory are cleared in order from the oldest data frame. When the data acquisition is stopped, the data frames remaining in the memory can be saved collectively to a file.

Setting the Filter for Retrieving Data (ID Filter)

You can set a bit pattern of the data frame to be acquired and acquire only the data frames that match the specified bit pattern using the Misc tab. This allows only the required data frames to be stored. If the data frame to be acquires is in the standard format, set the filter in the Standard box; if it is in the extended format, set the filter in the Extended box.

If the bit pattern is set to Bin, set a binary pattern using an array of three characters, 0, 1, and X.

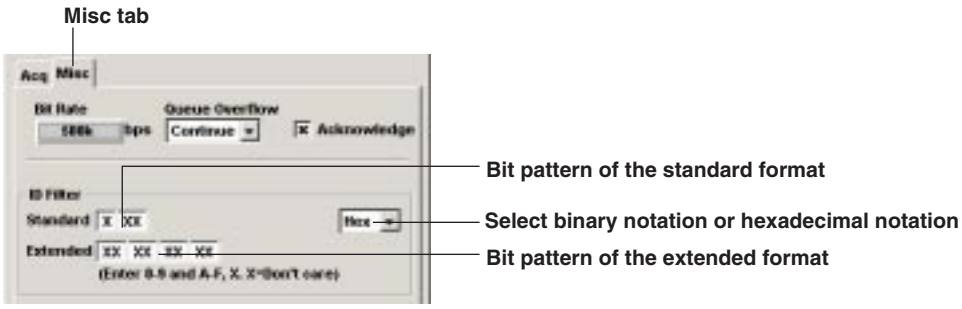
0: Pass the data through if the corresponding bit is 0.

1: Pass the data through if the corresponding bit is 1.

X: Pass the data through regardless of whether the corresponding bit is 0 or 1 (Don't care).

If the bit pattern is set to Hex, the pattern is set 4 bits at a time using hexadecimal notation. Thus, the pattern cannot be set in detail at the bit level. Set the pattern using a character array of 0 to 9, A to F, and X. "X" denotes Don't Care. All 4 bits of the bit pattern is set to "XXXX."

If you selected Bin and the 4 bits consist of a mixture of X, 0, and 1s, the value cannot be displayed in the Hex setting if you change the setting to Hex. 4 bits that cannot be displayed on the viewer is indicated with a $ mark.



Note

On the WE Control API sold separately, the bit pattern can be set only using binary values.

Setting the Trigger (Trigger)

Trigger Source (Source)

Select the signal for triggering. Select from the following:

Internal: Receives the data frames flowing on the CAN Bus, and activates a trigger when the data block of the data frame of a specified ID matches a specified condition. Trigger is activated according to the trigger condition specified on the operation panel.

BUSTRG: Bus signal (BUSTRG1/BUSTRG2) of the WE bus

Trigger Type

If the trigger source is set to Internal, you can select the trigger type for each channel.

Rise: A trigger is activated when the readout signal changes from below the trigger level to above the trigger level (edge trigger).

Fall: A trigger is activated when the readout signal changes from above the trigger level to below the trigger level (edge trigger).

Both: Both rising and falling (edge trigger)

High: A trigger is activated when the readout signal is greater than or equal to the specified trigger level or when it enters that condition (state trigger).

Low: A trigger is activated when the readout signal is less than or equal to the specified trigger level or when it enters that condition (state trigger).

X: A trigger is activated when the data frame of the message ID of the acquisition channel specified in advance is received. When this setting is used, you cannot set the trigger level.

Off: Trigger detection is not performed.

Trigger Level

You can set the trigger level when the trigger source is set to internal and the trigger type is set to a value other than X or Off. The selectable range varies depending on the data type (Value Type) selection.

- When the data type is unsigned
  0 to 2^N–1 (where N is the bit length (LN))
- When the data type is signed
  -2^{N-1} to 2^{N-1}–1 (where N is the bit length (LN))
- When the data type is float
  –3,40282E38 to 3,40282E38

Data Frame Format (Ext)

Select the check box when setting the ID of the data frame for activating the trigger to the extended format. Otherwise, the data frame is set to the standard format.

Message ID (ID)

Select the data frame ID for activating the trigger. For extended format, the selectable range is 0 to 0×1FFFFFFF (29 bits). For standard format, the selectable range is 0 to 0×7FF (11 bits).

Data Extraction Position (SB)

Set the data position of the data frame to start extracting using a bit number. The selectable range is from 0 to 63.

Bit Length (LN)

Set the bit length of data block to be extracted. The selectable range is from 1 to 64.

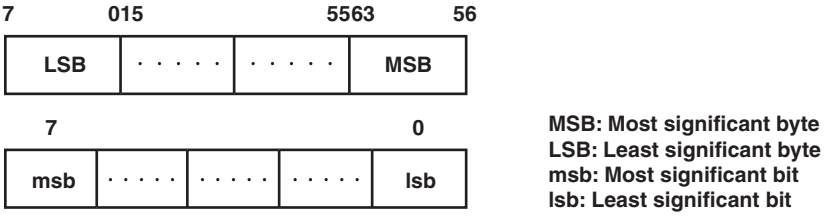
Data Type (Value Type)

Select the type for handling the extracted CAN data from the following.
Unsigned (Unsigned Integer) type
Signed(Signed Integer) type
Float type
If you select Float, the only selectable bit lengths are 32 and 64.

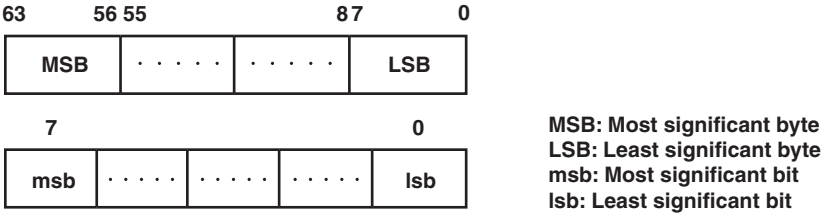
Endian

Select the format when storing the data block of the data frame to the memory.

Little: The bit number increases to the left at the bit level and to the right at the byte level starting with the lsb of the LSB of the beginning of the data frame.



Big: The bit number increases to the left at the bit level and to the right at the byte level starting with the lsb of the LSB of the end of the data frame.



Start Bit and Length are set using bit numbers in the order shown above.

Manual Trigger

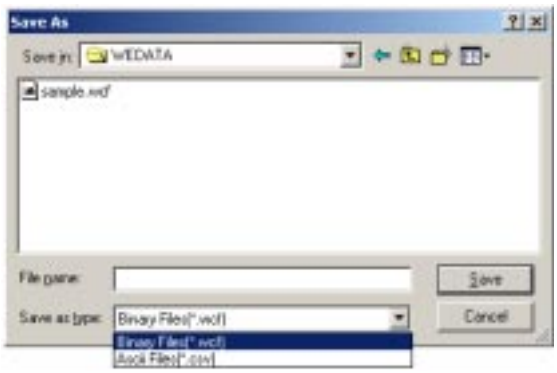
Click the **Manual Trigger** button to activate a trigger independently from the specified trigger source.

No. of Stored Frames

If you start acquisition by clicking the Start button, the number of frames that have been acquired is indicated in the range of 0 to 4,294,967,295. The update period is approximately 1 s. If the number of frames that have been acquired reaches 4,294,967,295, the indication returns to 0.

Saving the Data

Click the **Save Frame Data** button to read the data from the data memory and save the data in binary WCF (WE7000 CAN Binary Format) format (*.wcf) or CSV (*.csv) format.

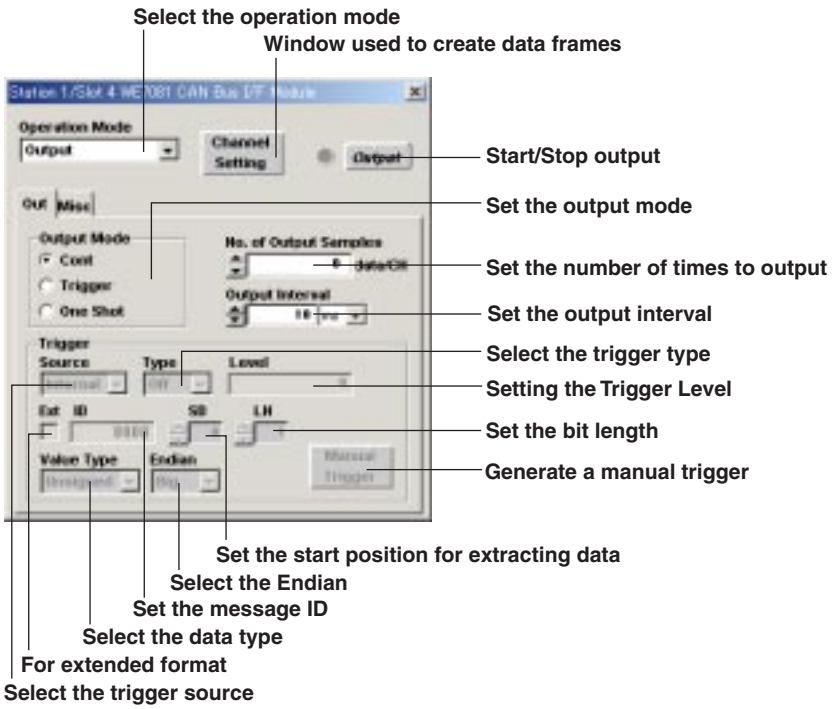


File Format

The file saved in WCF format can be converted into a file in CSV format using the converter provided. In addition, a converter is provided for creating a file in WCF format from the measurement data file saved in WVF format. For a description of each converter, see section 1.8, “WCF⇔CSV Converter and WVF⇒WCF Converter.”
For details on the data formats of the data frame, WCF format, and CSV format, see appendix 2, “Data Structure of Files.”

1.5 Data Block Signal Output Mode (Output)

Operation Panel



Selecting the (Operation Mode)

Select **Output**.

Starting/Stopping Output

Click the **Output** button to start the output operation. When the output operation is started, the output indicator to the left of the Output button illuminates, and you can no longer operate the setup items on the operation panel and all the buttons beside the Output button. The output operation continues until the Output button is clicked again. The output operation includes the trigger-wait state. If the output mode (see below) is set to Trigger or One Shot, the data frame may actually not be output even if the output indicator is illuminated. If the output mode is set to Cont and the output indicator is illuminated, the signal is output at constant intervals. However, the signal is not output if the module is not connected to the CAN Bus or in the Bus Off condition.

Setting Output Conditions

Output Mode

Select from the following.

Cont: Outputs the data frame continuously according to the specified definition and the number of output samples.

Trigger: Outputs the data frame when triggers are detected according to the specified definition and the number of output samples.

One Shot: Outputs the data frame once when a trigger is detected according to the specified definition and the number of output samples.

No. of Output Samples) (only when the output mode is set to Cont or Trigger)

You can set the number of times the data frame of each channel is output in the range of 0 to 2,147,483,647. If you set the value to 0, the data frame is output indefinitely.

Output Interval) (only when the output mode is set to Cont or Trigger)

The selectable range is 1 to 10 s (1-ms steps). The setting applies to all data frames specified on the channel setup screen.

Note

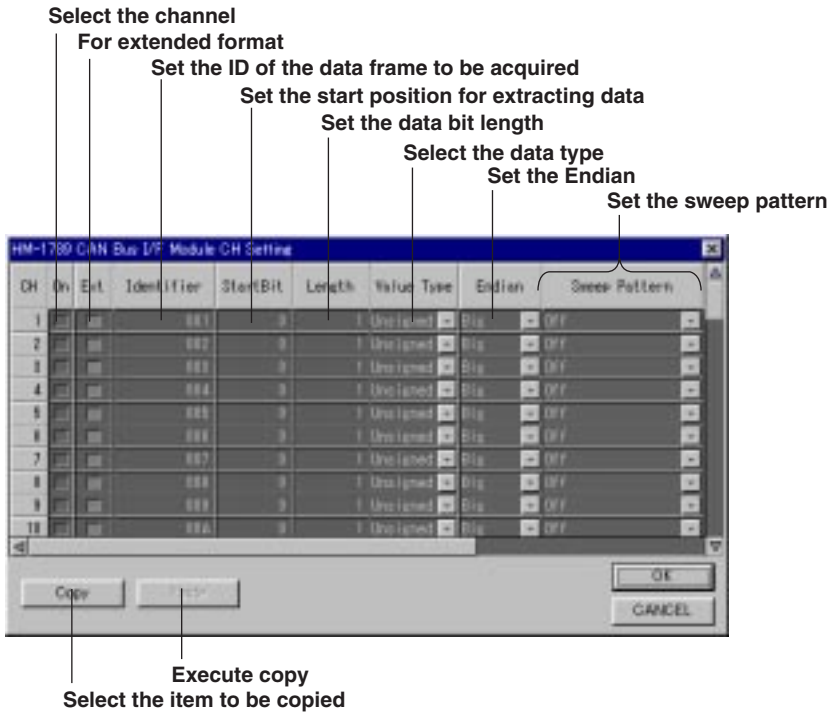
If the load on the CAN Bus is large or the number of output frames is large, the data frames may not be output at the specified output interval.

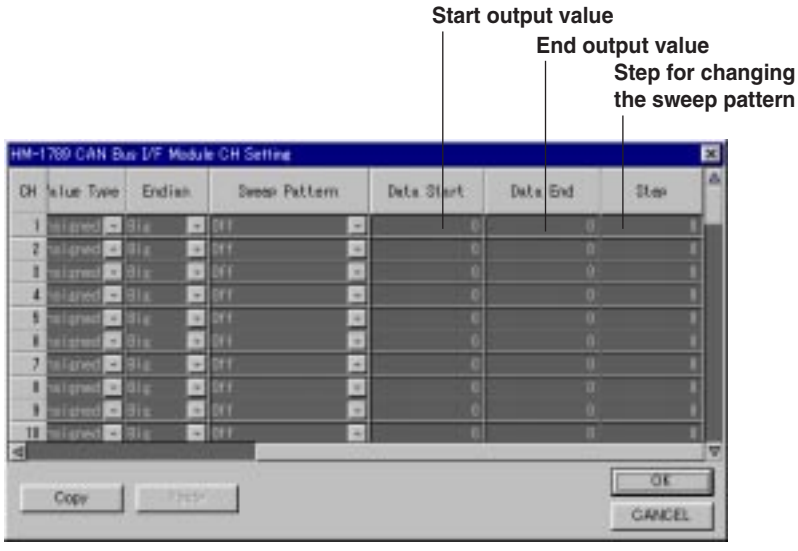
Creating Data Frames (Channel Setting)

In the data block signal output mode, data frames are created by defining multiple data sequences on the data field and output on the frame. The output data frame definition is specified as a channel. Up to 64 channels can be assigned.
Multiple channels can be included in a single data frame. As shown in the example below, CH1 and CH2 are embedded in the same data frame.

Start Bit = 0, Length = 16 bits → 2-byte integer(CH1)
Start Bit = 32, Length = 32 bits → 4-byte floating point (CH2)

Click the **Channel Setting** button to set the data field, sweep pattern, and other parameters.





Turning ON/OFF the Output Channel (On)
Select the check boxes for the channels you wish to output the data frames.

Data Frame Format (Ext)
Select the check box when setting the data frame to be output to the extended format. Otherwise, the data frame is set to the standard format.

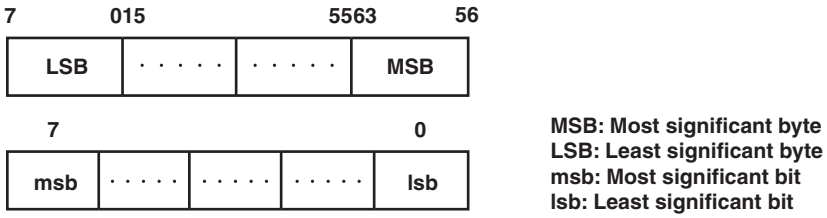
Message ID (ID)
Set the ID of the data frame to be acquired. For extended format, the selectable range is 0 to 0×1FFFFFFF (29 bits). For standard format, the selectable range is 0 to 0×7FF (11 bits).

Data Output Position (SB)
Set the data position of the data frame to start the output using a bit number. The selectable range is from 0 to 63.

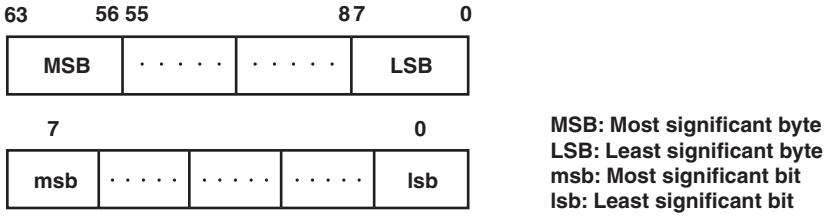
Bit Length (LN)
Set the bit length of the output data block. The selectable range is from 1 to 64.

Data Type (Value Type)
Select the output CAN data type from the following.
Unsigned (Unsigned Integer) type
Signed(Signed Integer) type
Float type
If you select Float, the only selectable bit lengths are 32 and 64.

Endian
Select the format when outputting the data block of the data frame to the CAN Bus.
Little: The bit number increases to the left at the bit level and to the right at the byte level starting with the lsb of the LSB of the beginning of the data frame.



Big: The bit number increases to the left at the bit level and to the right at the byte level starting with the lsb of the LSB of the end of the data frame.

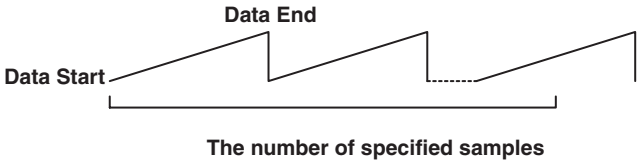


The output position and bit length of the data block are set using a sequence of bit numbers as shown above.

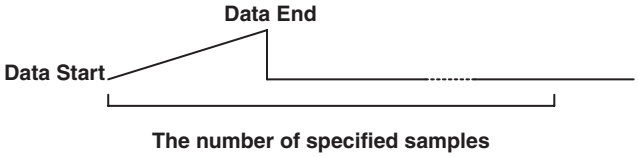
Sweep Pattern

You can change the output CAN data with time. You can select a sweep pattern for each channel.

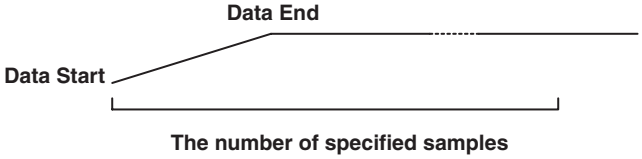
Ramp-Repeat: Repetitively outputs the slope specified by Data Start and Data End.



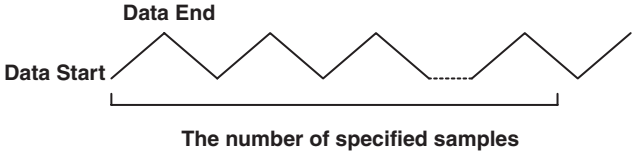
Ramp-single&Reset: Outputs the slope specified by Data Start and Data End once and outputs the data specified by Data Start last.



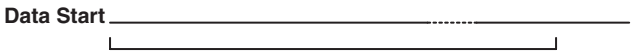
Ramp-Single&Hold: Outputs the slope specified by Data Start and Data End once and continues to output the data specified by Data End.



Triangle-Repeat: Outputs the slope specified by Data Start and Data End. When the Data End value is reached, the signal moves back toward Data Start. This operation is repeated.



Off: Outputs the data specified by Data Start.



Output Start Value (Data Start)

Set the output start value using an integer or a floating-point number.

Output End Value (Data End)

Set the output end value using an integer or a floating-point number.

Step

Set the step for changing the sweep pattern using an integer or a floating-point number.

Note

If the value derived by (Data End – Data Start)/Step is an indivisible number, the last step for outputting Data End is smaller than the step for outputting earlier data.

Copying/Pasting Channel Settings

The setup information of each channel can be copied to other channels. Click a channel number and click the **Copy** button to copy the setup information temporarily in the memory. Click the copy destination channel number and click the **Paste** button to display the dialog box shown below. Check the setup information to be copied and clear the check box for items that do not need to be copied. Click **OK** to complete the copy operation.

Setting the Trigger (only when the output mode is set to Trigger or One Shot)

Set the trigger detection condition for starting the output.

Trigger Source (Source)

Select the signal for detecting triggers. Select from the following:

Internal: Receives the data frames flowing on the CAN Bus, and activates a trigger when the data block of the data frame of a specified ID matches a specified condition. Trigger is activated according to the trigger condition specified on the operation panel.

BUSTRG: Bus signal (BUSTRG1/BUSTRG2) of the WE bus

Trigger Type

If the trigger source is set to Internal, you can select the trigger type for each channel.

Rise: A trigger is activated when the readout signal changes from below the trigger level to above the trigger level (edge trigger).

Fall: A trigger is activated when the readout signal changes from above the trigger level to below the trigger level (edge trigger).

Both: Both rising and falling (edge trigger)

High: A trigger is activated when the readout signal is greater than or equal to the specified trigger level or when it enters that condition (state trigger).

Low: A trigger is activated when the readout signal is less than or equal to the specified trigger level or when it enters that condition (state trigger).

X: A trigger is activated when the data frame of the message ID of the acquisition channel specified in advance is received. When this setting is used, you cannot set the trigger level.

Off: Trigger detection is not performed.

Trigger Level

You can set the trigger level when the trigger source is set to internal and the trigger type is set to a value other than X or Off. The selectable range varies depending on the data type (Value Type) selection.

- When the data type is unsigned
  0 to 2^N–1 (where N is the bit length (LN))
- When the data type is signed
  -2^{N-1} to 2^{N-1}–1 (where N is the bit length(LN))
- When the data type is float
  –3,40282E38 to 3,40282E38

Data Frame Format (Ext)
Select the check box when setting the data frame ID to the extended format. Otherwise, the data frame is set to the standard format.

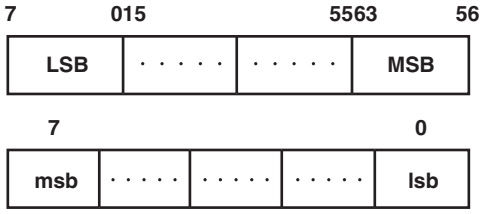
Message ID (ID)
Set the data frame ID. For extended format, the selectable range is 0 to 0×1FFFFFFF (29 bits). For standard format, the selectable range is 0 to 0×7FF (11 bits).

Data Extraction Position (SB)
Set the data position of the data frame to start extracting using a bit number. The selectable range is from 0 to 63.

Bit Length (LN)
Set the bit length of the data block. The selectable range is from 1 to 64.

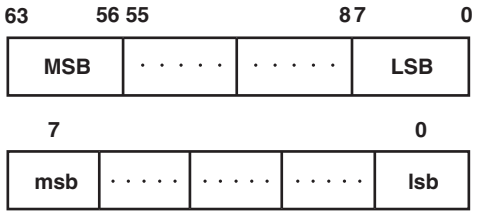
Data Type (Value Type)
Select the CAN data type from the following.
Unsigned (Unsigned Integer) type
Signed(Signed Integer) type
Float type
If you select Float, the only selectable bit lengths are 32 and 64.

Endian
Select the format when storing the data block of the data frame to the memory.
Little: The bit number increases to the left at the bit level and to the right at the byte level starting with the lsb of the LSB of the beginning of the data frame.



MSB: Most significant byte
LSB: Least significant byte
msb: Most significant bit
lsb: Least significant bit

Big: The bit number increases to the left at the bit level and to the right at the byte level starting with the lsb of the LSB of the end of the data frame.



MSB: Most significant byte
LSB: Least significant byte
msb: Most significant bit
lsb: Least significant bit

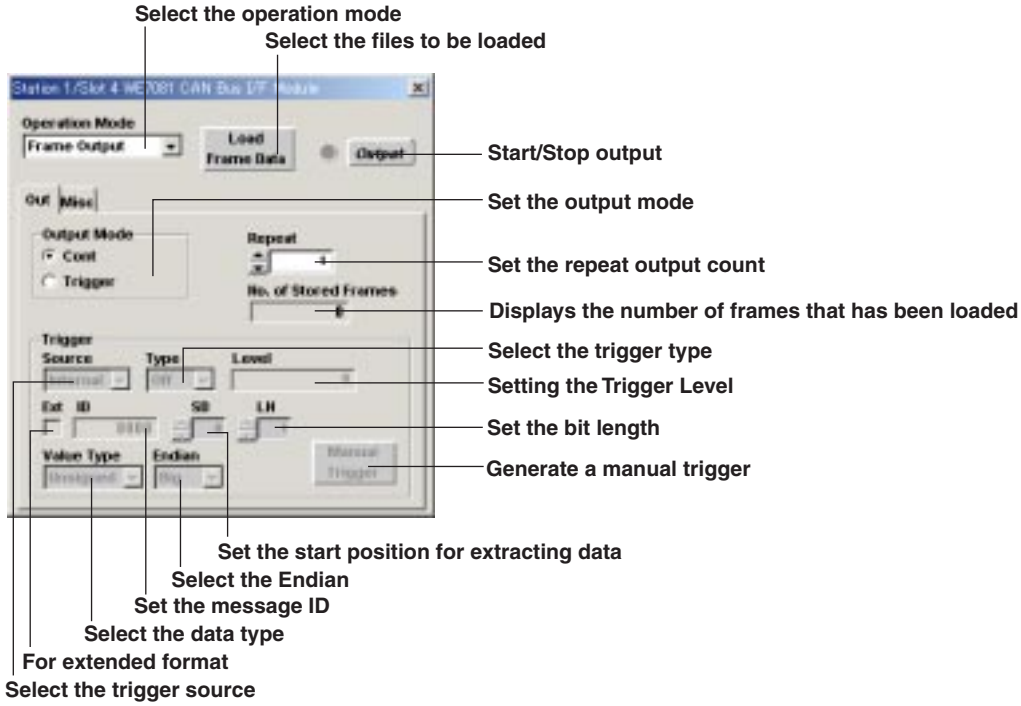
Start Bit and Length are set using bit numbers in the order shown above.

Manual Trigger

Click the **Manual Trigger** button to activate a trigger independently from the specified trigger source.

1.6 Data Frame Output Mode (Frame Output)

Operation Panel

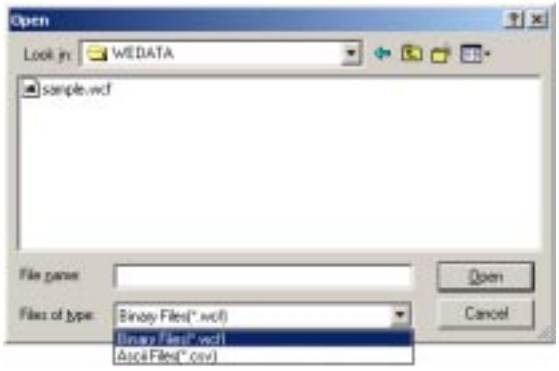


Selecting the (Operation Mode)

Select **Frame Output**.

Selecting the Data File to Be Loaded and Indication of the Number of Data Frames

Click the **Load Frame Data** button and select the frame data file in WCF or CSV format to be downloaded to the output memory. When the download is complete, the number of data frames that has been downloaded is indicated in No. of Stored Frames.



Starting/Stopping Output

Click the **Output** button to start the output operation. When the output operation is started, the output indicator to the left of the Output button illuminates, and you can no longer operate the setup items on the operation panel and all the buttons beside the Output button. The output operation continues until the Output button is clicked again. The output operation includes the trigger-wait state. If the output mode (see below) is set to Trigger, the data frame may actually not be output even if the output indicator is illuminated. If the output mode (see below) is set to Cont, the data frame is output at all times when the output indicator is illuminated.

Setting Output Conditions

Output Mode

Select from the following.

Cont: Continuously outputs the loaded data frame.

Trigger: Outputs the data frame the number of specified times each time a trigger occurs.

Repeat Output Count (Repeat)

Select the number of times to output the data frame in the range of 0 to 100. If you set the number to 0, the output continues until the output is stopped. If you set the number between 1 and 100, the data frame is output the specified number of times and the output stops.

Setting the Trigger (only when the output mode is set to Trigger)

Set the trigger detection condition for starting the output.

Trigger Source (Source)

Select the signal for detecting triggers. Select from the following:

Internal: Receives the data frames flowing on the CAN Bus, and activates a trigger when the data block of the data frame of a specified ID matches a specified condition. Trigger is activated according to the trigger condition specified on the operation panel.

BUSTRG: Bus signal (BUSTRG1/BUSTRG2) of the WE bus

Trigger Type

If the trigger source is set to Internal, you can select the trigger type for each channel.

Rise: A trigger is activated when the readout signal changes from below the trigger level to above the trigger level (edge trigger).

Fall: A trigger is activated when the readout signal changes from above the trigger level to below the trigger level (edge trigger).

Both: Both rising and falling (edge trigger)

High: A trigger is activated when the readout signal is greater than or equal to the specified trigger level or when it enters that condition (state trigger).

Low: A trigger is activated when the readout signal is less than or equal to the specified trigger level or when it enters that condition (state trigger).

X: A trigger is activated when the data frame of the message ID of the acquisition channel specified in advance is received. When this setting is used, you cannot set the trigger level.

Off: Trigger detection is not performed.

Trigger Level

You can set the trigger level when the trigger source is set to internal and the trigger type is set to a value other than X or Off. The selectable range varies depending on the data type (Value Type) selection.

- When the data type is unsigned
  0 to 2^N–1 (where N is the bit length (LN))
- When the data type is signed
  -2^{N-1} to 2^{N-1}–1 (where N is the bit length (LN))
- When the data type is float
  –3,40282E38 to 3,640282E38

Data Frame Format (Ext)

Select the check box when setting the data frame ID to the extended format. Otherwise, the data frame is set to the standard format.

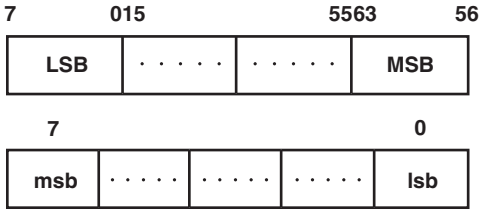
Message ID (ID)
Set the data frame ID. For extended format, the selectable range is 0 to 0×1FFFFFFF (29 bits). For standard format, the selectable range is 0 to 0×7FF (11 bits).

Data Extraction Position (SB)
Set the data position of the data frame to start extracting using a bit number. The selectable range is from 0 to 63.

Bit Length (LN)
Set the bit length of the data block. The selectable range is from 1 to 64.

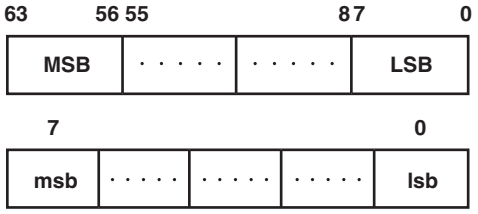
Data Type (Value Type)
Select the CAN data type from the following.
Unsigned (Unsigned Integer) type
Signed(Signed Integer) type
Float type
If you select Float, the only selectable bit lengths are 32 and 64.

Endian
Select the format when storing the data block of the data frame to the memory.
Little: The bit number increases to the left at the bit level and to the right at the byte level starting with the lsb of the LSB of the beginning of the data frame.



MSB: Most significant byte
LSB: Least significant byte
msb: Most significant bit
lsb: Least significant bit

Big: The bit number increases to the left at the bit level and to the right at the byte level starting with the lsb of the LSB of the end of the data frame.



MSB: Most significant byte
LSB: Least significant byte
msb: Most significant bit
lsb: Least significant bit

Start Bit and Length are set using bit numbers in the order shown above.

Manual Trigger

Click the **Manual Trigger** button to activate a trigger independently from the specified trigger source.

1.7 Displaying Waveforms, Saving Acquired Data Automatically, Converting Files, and Other Functions

The following functions are common to all measurement modules of the WE7000 Control Software. For details on the functions, see the WE7000 User's Manual (IM707001-01E).

Controlling the Timing of the Start of the Acquisition (Arming)

You can control the timing of the start of measurement by using the arming signal set in the trigger source/time base source/arming setting dialog box. When the arming signal (ARM) bus is connected to the measurement module in the trigger source/time base source/arming setting dialog box, clicking Start on the operation panel causes the module to enter the arming signal wait state. The acquisition starts when the arming signal becomes True. For details on the settings on the trigger source/time base source/arming setting dialog box, see section 4.6, "Setting Trigger Source/Time Base Source/Arming" in the WE7000 User's Manual (IM707001-01E).

Displaying Waveforms (valid only when in data block signal acquisition mode)

The WE7081 allows acquisition data to be monitored as waveforms. By default, the waveforms are automatically displayed on the Waveform Monitor of the WE7000 Control Software when acquisition is started on the WE7081 operation panel.

Saving Acquired Data Automatically (valid only when in data block signal acquisition mode)

Besides saving the data displayed on the waveform monitor, you can also save the acquired data automatically. You can select whether to save the data to a single file or to multiple files by specifying the number of data points per file.

Converting Acquisition Data Files

Acquisition data that is saved in data block signal acquisition mode can be converted to ASCII data in CSV format (*.csv) or to a physical value in 32-bit floating point format (conforming to IEEE754-1985) (*.wvf).

Data that has been saved in data frame acquisition mode is saved in WCF format (WE7000 CAN Binary Format) or CSV format. The conversion software provided can be used to convert the saved data into CSV format or WCF format. For a description of the conversion software, see section 1.8, "WCF⇔CSV converter and WVF⇒WCF Converter."

Scaling the Acquisition Data (valid only when in data block signal acquisition mode)

Set the acquired values at any two points (VP1 and VP2) and their corresponding physical values (SP1 and SP2). The values at these four points define the scale converting equation (Y = ax + b). The acquired values are converted to physical values according to this equation. The waveform can be displayed, or the acquired data can be saved.

1.8 WCF⇔CSV converter and WVF⇒WCF Converter

The WE7000 Control Software comes with the following file format conversion tools.

WCF⇔CSV Converter: Converts a binary data file in WCF format (*.wcf) to an ASCII data file in CSV format (*.csv) or vice versa.

WVF⇒WCV Converter: Creates a binary data file in WCF format (*.wcf) from a measurement data file in WVF format (*.wvf)

WCF⇔CSV Converter

The data in WCF (WE7000 CAN Binary Format) binary format saved in the data frame acquisition mode can be converted into CSV format so that Excel or other general-purpose text editors can be used to check or edit the frame data contents.

Installation Directory

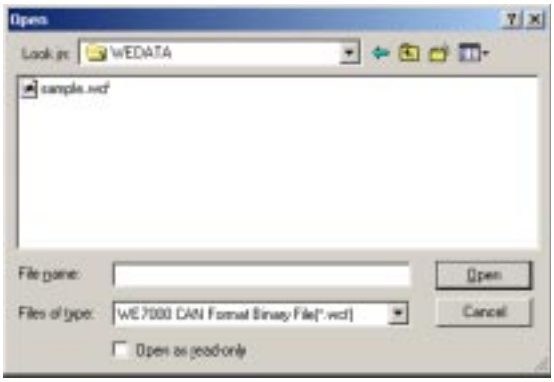
The WCF⇔CSV Converter is installed as “Wcf_CsvConverter.exe” when the WE7000 Control Software is installed.

- Installation directory example
  C:\program files\we7000\Wcf_CsvConverter.exe

Procedure

1. When you start the software, the following window below opens.

2. Click **.....** to display the following dialog box. Select a file in WCF format or CSV format here.



3. When you select a file, the name of the selected file appears in the box. If the entry box of the other file is left empty, the same file name with a different extension is automatically assigned after the conversion is executed.
   Click **Exit** to execute the conversion and save the file.

   If the specified destination file name already exists, the following message appears.

   To overwrite the file, select Yes. If you select No, the operation is cancelled.

WCF Data to CSV Data Conversion Example

```
File Version, 1
No. of Data Frames, 1000
Year/Month/Day, 2003/03/25
Hour:Min:Sec, 18:08:59
Time, Format, Identifier, DLC, Data
0.0081, 0, 1, 4, 04 08 0C 10 00 00 00 00
0.0181, 0, 1, 4, 05 0A 0F 14 00 00 00 00
0.0281, 0, 1, 4, 06 0C 12 18 00 00 00 00
0.0381, 0, 1, 4, 07 0E 15 1C 00 00 00 00
0.0480, 0, 1, 4, 08 10 18 20 00 00 00 00
0.0581, 0, 1, 4, 09 12 1B 24 00 00 00 00
0.0680, 0, 1, 4, 0A 14 1E 28 00 00 00 00
0.0781, 0, 1, 4, 0B 16 21 2C 00 00 00 00
0.0881, 0, 1, 4, 0C 18 24 30 00 00 00 00
0.0982, 0, 1, 4, 0D 1A 27 34 00 00 00 00
0.1082, 0, 1, 4, 0E 1C 2A 38 00 00 00 00
0.1182, 0, 1, 4, 0F 1E 2D 3C 00 00 00 00
0.1282, 0, 1, 4, 10 20 30 40 00 00 00 00
. . . . . .
. . . . . .
. . . . . .
9.9234, 0, 1, 4, 56 34 2D 1C 00 00 00 00
9.9334, 0, 1, 4, 57 36 30 20 00 00 00 00
9.9434, 0, 1, 4, 58 38 33 24 00 00 00 00
9.9534, 0, 1, 4, 59 3A 36 28 00 00 00 00
9.9634, 0, 1, 4, 5A 3C 39 2C 00 00 00 00
9.9734, 0, 1, 4, 5B 3E 3C 30 00 00 00 00
9.9834, 0, 1, 4, 5C 40 3F 34 00 00 00 00
9.9934, 0, 1, 4, 5D 42 42 38 00 00 00 00
10.0033, 0, 1, 4, 5E 44 45 3C 00 00 00 00
```

WVF⇒WCF Converter

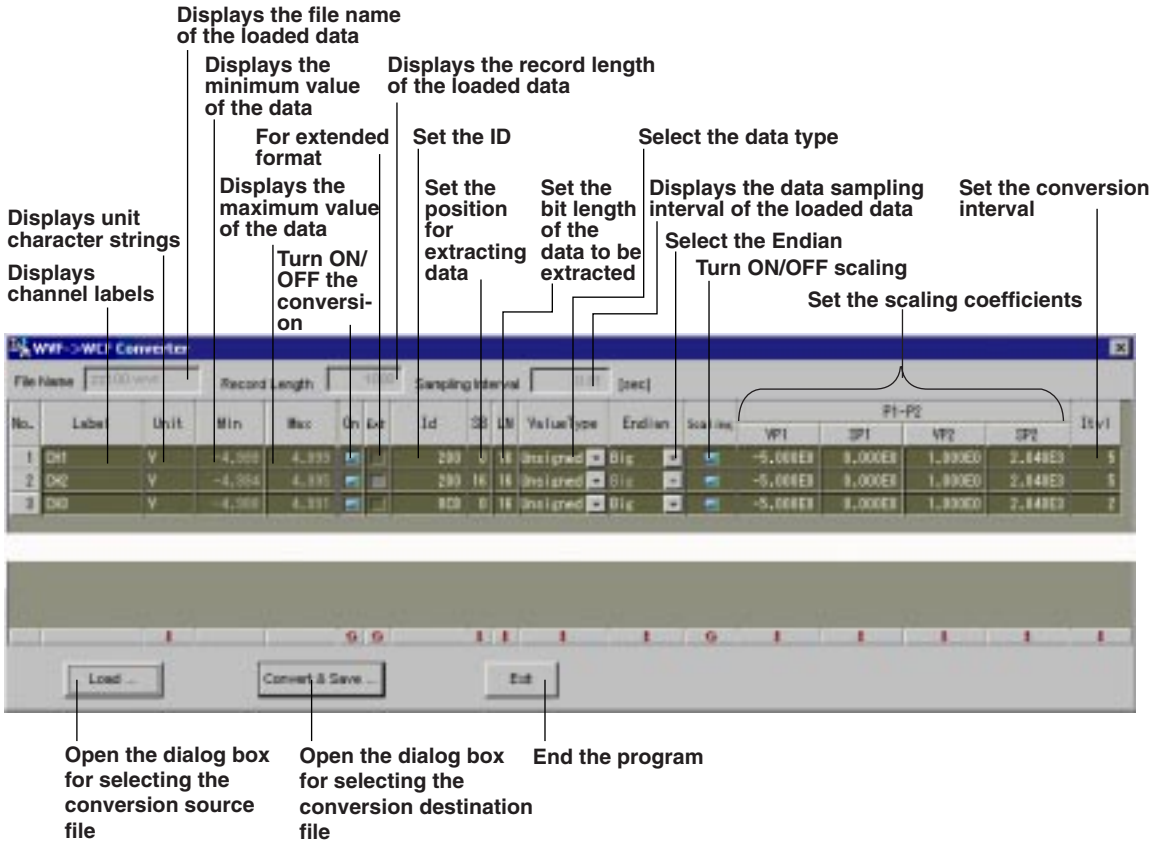
The WVF⇒WCF Converter can create a file in WCF format in which the data block of the CAN data frame fluctuates in the same fashion as the waveform data measured on other measurement modules and waveform data created using the arbitrary waveform editor. By outputting the WCF file that you created in data frame output mode, frame data in which the data block fluctuates in the same fashion as the data in a WVF file can be transmitted on the CAN Bus.

Starting the Program

Start the WE Control Software and choose **Convert WVF to WCF** from the **Tools** menu.

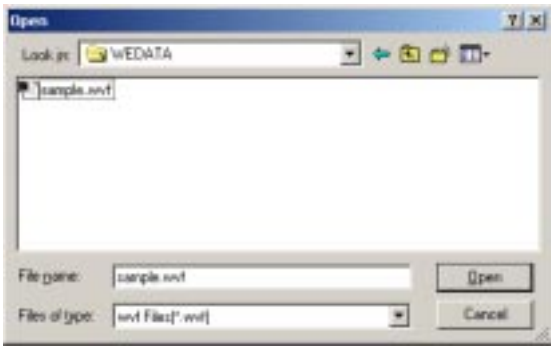
Procedure

1. When you start the software, the following window below opens.



Loading Files

1. Clicking the **Load** button displays the dialog box shown below.



2. Select a file with .wvf extension for the conversion source, and click **Open**. The contents of the loaded data are shown on the main window.

Selecting the Channels to Be Converted

3. Select the **On** check box on the channels in which the data is to be converted into the data frame of CAN data. Multiple channels can be selected.

Setting the Conversion Conditions

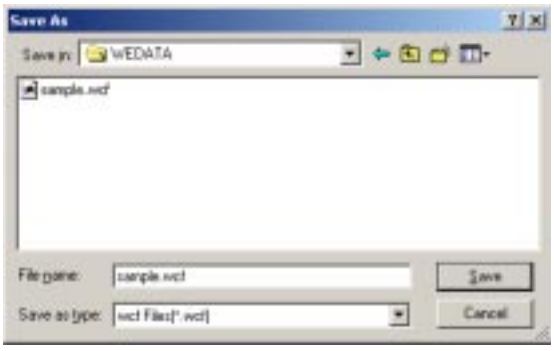
4. Set the ID (message ID) of the data frame after the conversion and SB (start bit position), LN (bit length), Value Type (data type), and Endian of the data expansion destination. To scale the values, select the **Scaling** check box and set the conversion coefficients (VP1, SP1, VP2, and SP2). The DLC after the conversion is automatically assigned to 1, 2, 4, or 8.

Setting the Conversion Interval

5. Set the interval (the number of samples) to create the frame data with respect to the sampling interval of the loaded data (division factor with respect to the sampling interval) in the range of 1 to 10000.

Converting and Saving

6. Click **Convert & Save** to open the following dialog box. Select a destination file name and click **Save**.



Saving and Loading the Conversion Conditions

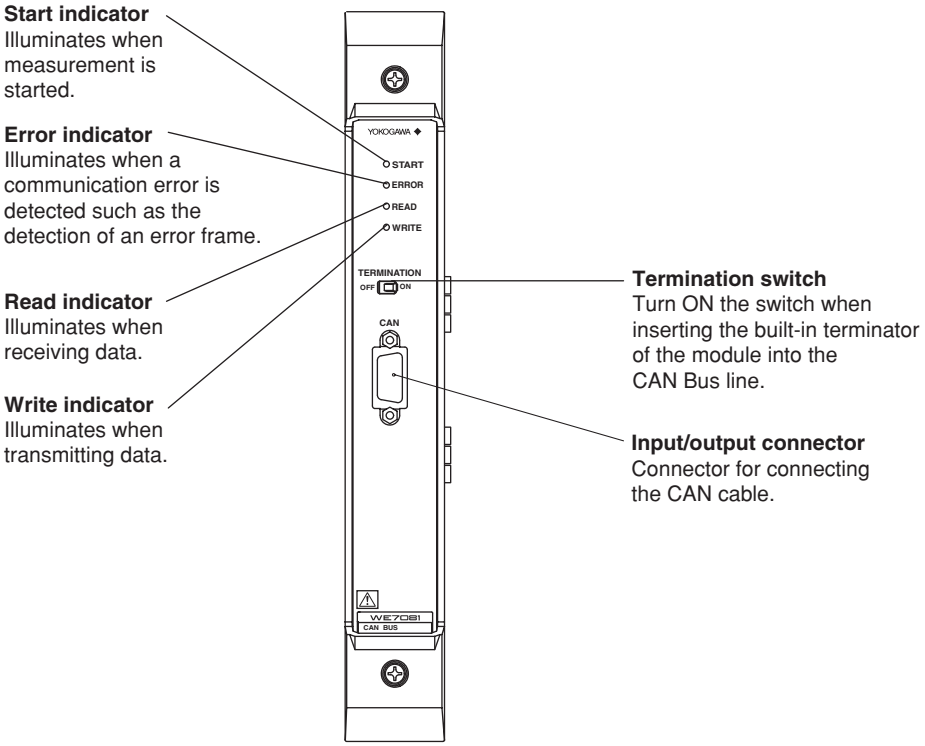
The conversion conditions such as the ID, bit position, and scale information can be saved to a file. The conversion condition file extension is .tfs. By loading the stored conversion condition file, the conversion settings can be reverted.

- Saving the conversion conditions
  Click **Convert & Save** to open the following dialog box. As shown below, select the .tfs file in the Save as type box, set the destination file name, and click **Save**.

- Loading conversion conditions
  Click **Load** to open the following dialog box. As shown below, select the .tfs file in the Files of type box, set the load file name, and click **Open**.

1.9 Names and Functions of Sections

Front Panel

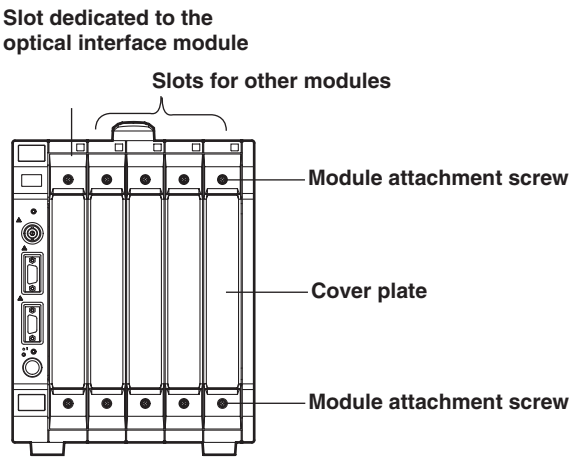


2.1 Installing the Module into the Measuring Station

Preparing to Install the Module

The measuring station comes with each slot covered with a cover plate as shown in the figure below. Verify that the power supply is not connected to the measuring station, and then loosen the module attachment screws (2 locations) and remove the cover plate from the slot where the module is going to be installed. Please note that the slot on the left end is dedicated to the communication module and therefore this module cannot be installed there.

* The following figure shows an example of the measuring station WE400.



Installing the WE7081 CAN BUS INTERFACE Module

WARNING

- Make sure to fasten the top and bottom attachment screws. If you connect the input signal cable without fastening the attachment screws, the protective grounding of the measurement module provided by the power cord is compromised and may cause electric shock.

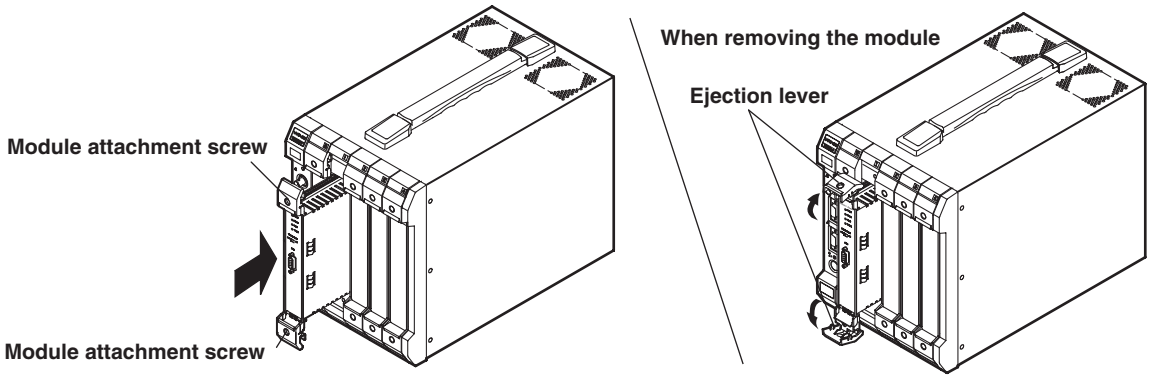
CAUTION

- To avoid damaging the instrument when installing modules, make sure to turn OFF the standby power switch of the measuring station.
- Be careful not to get your fingers caught in the ejection lever when inserting the module. In addition, do not put your hand inside the slot, because there are protrusions along the module guide that may injure your fingers.
- Do not remove the cover plates from unused slots. It can cause overheating and malfunction. The cover plates are also needed to minimize the influence of electromagnetic interference.

Insert the module along the guide rail of the slot from which you removed the cover plate. Insert the module until it clicks into the connector. Be careful not to get your fingers caught in the ejection lever while inserting the module. When the module is securely inserted, fasten the module attachment screws (tightening torque: 0.6 to 0.7 N-m).

To remove the module, loosen the module attachment screws and pull the ejection lever from the inside to the outside. This will force the module out of the slot.

<There is an illustration on the next page.>

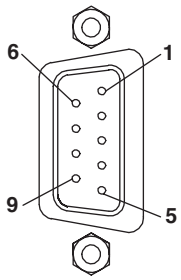


Note

The WE7081 CAN BUS INTERFACE Module does not have module link function.

2.2 Connecting the Input/Output Signal Cable

Pin arrangement



Below are the pin assignments of the D-sub connector (9-pin male) on the front panel of the module.

- Signal name and function
  CAN_L: CAN Low signal GND: Ground
  CAN_H: CAN High signal NC: Not used (no connection)
- Pin Assignments

Pin No.	Signal Name
1	(NC)
2	CAN_L
3	GND
4	(NC)
5	(NC)
6	GND
7	CAN_H
8	(NC)
9	(NC)

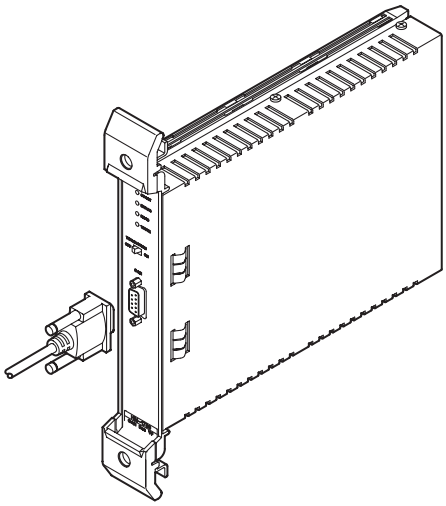
* Attachment screws are of inch specification

CAUTION

- Applying a voltage exceeding the maximum input voltage can damage the input section.

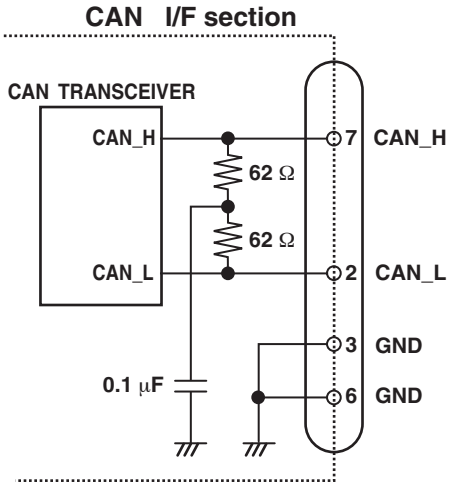
Connecting the Signal Cable

When connecting the signal cable to the D-sub connector, make sure to securely fasten the attachment screws.



2.3 Terminator

You can insert a terminator (124 Ω) between CAN_H and CAN_L on the CAN Bus line by turning ON the terminator switch on the front panel as shown below.



3.1 Troubleshooting

- If servicing is necessary, or if the instrument is not operating correctly after performing the following corrective actions, contact your nearest YOKOGAWA dealer.
- To verify that the module is operating correctly, perform the self test as described on the next page.

Description	Probable Cause/Corrective Action	Reference Page
Module does not operate.	Check to see that the module is installed correctly into the station. Also, install the module into another slot, and check whether it will operate there. If it operates in the other slot, the arming is not set properly or the measuring station is likely to have malfunctioned. If the module is installed correctly and does not operate, the connector might be bad or the IC may have malfunctioned. In either case, contact your nearest YOKOGAWA dealer.	2-1, *
Waveform data cannot be acquired.	Check that the signal input lines are properly connected.	2-3
Measured values are not correct.	Check whether the ambient temperature and humidity are within the allowed ranges. If you did not allow a warm-up time of 30 minutes, try measuring again after the warm-up time has passed.	4-7
Trigger does not activate	Check whether the trigger setting is adequate for the input source in the operation panel. If you are using the bus trigger signal, verify that the settings are correct in the trigger source/time base source/ arming setting dialog box of the WE7000 Control Software.	1-10, 1-15, 1-26 1-34, 1-37
The waveform monitor does not appear.	Check to see that the waveform monitor ON/OFF button, located to the right of the Start button of the operation, is not set to OFF.	1-9

* See the WE7000 User's Manual (IM 707001-01E).

3.2 Self Test

If you believe that the module is not operating correctly, perform the self test according to the following steps:

Executing Self Test

1. Select **Self Test** from the **System** menu of the WE7000 Control Software.

2. In the Self Test dialog box that appears, select the station name and enter the slot number corresponding to the module, and click **Execute**.
   "Executing..." is displayed in the Result display box.
   The four LEDs on the front panel illuminate in order from the top, and all four LEDs illuminate at once at the end.

Verifying Test Results

If a value other than "0" is displayed in the Result display box of the Self Test dialog box or the LEDs do not illuminate, the module is probably malfunctioning. In this case, contact your nearest YOKOGAWA dealer.

3.3 Maintenance

Maintenance of Parts

There are no parts in this module that require periodic replacement.

4.1 Performance Specifications

Number of ports

1

Connector Type

D-Sub 9-pin (male)

Controller

Philips SJA1000 CAN chip

Transceiver

Built in the module

Terminator

124 Ω, switch the terminator On/Off using the dipswitch on the front panel

Data Memory

8 MB FIFO buffer

Output Memory

8 MB FIFO buffer

Supported Protocol

Physical layer: ISO-11898 (High Speed Communication)
CAN in Automation: CAN2.0B (Standard & extended message format)

Save Format of Data

Binary file in WVF (YOKOGAWA measurement standard) format
Binary file in WCF (WE7000 CAN Binary Format) format
Can be saved in binary or ASCII in CSV format

Bit Rate

10 k, 20 k, 33.3 k, 50 k, 62.5 k, 83.3 k, 100 k, 125 k, 250 k, 500 k, 800 k, 1 Mbps, and Other
Time quanta and sample point are selectable

Endian

Little or Big selectable

Synchronized Operation

Possible by sharing the trigger signal and clock signal

4.2 Specifications Specific to Operation Modes

Data Block Signal Acquisition

Number of Channels
1 to 64
Acquisition Mode
Trigger and free run
Trigger Source (only in trigger mode)
Internal trigger and bus trigger signal of the measuring station
Pretrigger Amount (only in trigger mode)
Set in the range from 0 to (the record length – 2)
Trigger Hold Off (only in trigger mode)
Record length to 8,388,608
Time Base
Internal clock and bus clock signal of the measuring station
Data Sampling Interval
1 ms to 10 s (1-ms steps)
Remote Frame Output Interval
1 to 9999 times (integer multiple of the data sampling interval)
Memory Partition (only in trigger mode)
1, 2, 4, 8, 16, 32, 64, 128, and 256
Record Length
100 to (8,388,608/(the number of memory partitions) × the number of channels)/data size) points.
4,194,304/((the number of memory partitions) × the number of channels)/data size) points (when repetitively acquiring data)
(only in trigger mode)
Number of Acquisitions (only in trigger mode)
1 to 2,147,483,647
Output Mode
One shot output, manual output, periodic output, trigger synchronization output, remote frame synchronization output, and sequence output
Alarm Output (only in free run mode)
Trigger output the result of high limit, low limit, within limits, rising, and falling to the internal bus (BUSTRG1/BUSTRG2). Output a preset data frame.
One Shot Output
Output a preset data frame once using the Output button.
Manual Output
Output the data frame selected on the channel setup panel once using the Send button. When Auto Send is enabled, data is output automatically when the data value is changed
Periodic Output
Output the data frame selected on the channel setup panel at 0.1 to 100 s (0.1 s steps) intervals.
Trigger Synchronization Output
Output the data frame selected on the channel setup panel each time a trigger is detected.
Remote Frame Synchronization Output
Output the data frame selected on the channel setup panel each time a remote frame is received.
Sequence Output
Sequentially output the data frames of contents specified in advance on the sequence table.
Up to 1024 frames can be specified on the sequence table.

Data Field Extraction Setting
Turn ON/OFF each channel, select the remote frame, select the extended format, set the data frame ID, set the extraction position, set the bit length, select the data type, select the Endian, set the internal trigger (only in trigger mode), set the internal alarm (only in free run mode), set the scaling, and select the graph method of NAN data.
Saving and Loading of Database Files
Load the data frame ID, extraction position, bit length, data type, Endian, and scaling settings of each channel from a CAN database (dbc format or CSV format) and save to a CAN database file (CSV format only).

Data Frame Acquisition

Number of Acquired Frames
0 to 4,294,967,295 (0 = infinite number of times), maximum number of frames that can be saved = 419430
Load Data Filter Setting
Bit pattern: Hexadecimal or binary
Hex: 0, 1, 2, ... E, F, and X (Don't Care) for every 4 bits
Binary: 0, 1, or X (Don't Care)
Trigger Source
Internal trigger and bus trigger signal of the measuring station
Trigger Type
Edge trigger, state trigger, and data frame ID receive timing
Other Specifications Related to the Trigger
Select the extended format, set the data frame ID, set the extraction position, set the bit length, select the data type, select the Endian, and execute manual trigger.

Data Block Signal Output

Output Mode
Continuous, trigger, and one shot
Output Interval
1 to 10000 ms (1-ms steps)
Frame Data Output Count
0 to 2,147,483,647 (0 = infinite number of times)
Trigger Source (only in trigger mode or one shot output mode)
Internal trigger and bus trigger signal of the measuring station
Trigger Type (only in trigger mode or one shot output mode)
Edge trigger, state trigger, and data frame ID receive timing
Other Specifications Related to the Trigger (only in trigger mode or one shot output mode)
Select the extended format, set the data frame ID, set the extraction position, set the bit length, select the data type, select the Endian, and execute manual trigger.
Data Field Extraction Setting
Turn ON/OFF each channel, select the extended format, set the data frame ID, set the extraction position, set the bit length, select the data type, select the Endian, select the sweep pattern, set the output start/end value, and the step for changing the sweep pattern.

Data Frame Output

Output Mode
Continuous and trigger
Repeat Output Count
0 to 100 (0 = infinite number of times)
Trigger Source (only in trigger mode or one shot output mode)
Internal trigger and bus trigger signal of the measuring station

Trigger Type (only in trigger mode or one shot output mode)
Edge trigger, state trigger, and data frame ID receive timing
Other Specifications Related to the Trigger (only in trigger mode or one shot output mode)
Select the extended format, set the data frame ID, set the extraction position, set the bit length, select the data type, select the Endian, and execute manual trigger.

4.3 Default Values (Factory Default Settings)

Operation Mode: Acquisition
Bit Rate: 500 kbps
Queue Overflow (handling): Cont
Acknowledge (ON/OFF): On

Data Block Signal Acquisition Settings
Acquisition Mode: Triggered
Source (trigger source): Internal
Pretrigger: 0
Hold Off: 1000
Time Base: Internal
Sampling Interval: 10 ms
Memory Partition: 1
Record Length: 1000
No. of Acquisitions: 1
Data Frame Output Settings
  Out Mode: One Shot
  One Shot Output
    Ext (ON for extended format): OFF
    Identifier (ID): 0
    DLC (data field length): 1
    DATA (output data): 0
  Auto Send: Off
  Period (output period): 1.0 s
  No. of Repeat (sequence output): 1
Repeat (repetitive measurement): On
Channel Extraction Settings
  On (channel ON/OFF): Off
  Ext (ON when the ID format is extended): Off
  ID (ID of the data frame to be acquired): 0
  SB (data extraction start position): 0
  LN (bit length): 1
  Value Type (data type): Unsigned
  Endian: Big
  Type (trigger type): Rise on CH1, Off on others
  Level (trigger level): 0
  Label: None
  Scaling: Off
  Unit: None
  Rq (transmit or not transmit the remote frame): Off
  Rq Interval (remote frame output interval): 1
  Output On: Off
  Output Value: 0
  Output DLC: 1
  Scaling Type: ax+b
  Integer NAN (graph display method of NAN data): Full bit
  Trig Combination: OR

Data Frame Acquisition Settings

No. of Frames: 1000
Identifier Filter (read data filter): All bits set to X, Hex display
Trigger Settings
- Source (trigger source): Internal
- Type (trigger type): Off
- Level (trigger level): 0
- Ext (ON for extended format): Off
- ID (data frame ID): 0
- SB (data extraction start position): 0
- LN (bit length): 1
- Value Type (data type): Unsigned
- Endian: Big

Data Block Signal Output

Output Mode: Cont
Output Interval: 10 ms
No. of Output Samples: 0
Trigger Settings
- Source (trigger source): Internal
- Type (trigger type): Off
- Level (trigger level): 0
- Ext (ON for extended format): Off
- ID (data frame ID): 0
- SB (data extraction start position): 0
- LN (bit length): 1
- Value Type (data type): Unsigned
- Endian: Big

Channel Settings
- On (channel ON/OFF): Off
- Ext (ON when the ID format is extended): Off
- ID (ID of the data frame to be output): 0
- SB (data extraction start position): 0
- LN (bit length): 1
- Value Type (data type): Unsigned
- Endian: Big
- Sweep Pattern: Off
- Data Start (output start value): 0
- Data End (output end value): 0
- Step (step for changing the sweep pattern): 0

Frame Output Settings

Output Mode: Cont
Repeat (repeat output count): 0
Trigger Settings
- Source (trigger source): Internal
- Type (trigger type): Off
- Level (trigger level): 0
- Ext (ON for extended format): Off
- ID (data frame ID): 0
- SB (data extraction start position): 0
- LN (bit length): 1
- Value Type (data type): Unsigned
- Endian: Big

4.4 General Specifications

Safety Standards

Complies with CSA C22.2 No.1010.1 and EN61010-1, conforms to JIS C1010-1

- Overvoltage Category CAT I and II[*1]
- Pollution Degree 1 and 2[*2]

*1 Overvoltage Categories define transient overvoltage levels, including impulse withstand voltage levels.

Overvoltage Category I:	Applies to equipment supplied with electricity from a circuit containing an overvoltage control device.
Overvoltage Category II:	Applies to equipment supplied with electricity from fixed installations like a distribution board.

*2

Pollution Degree:	Applies to the degree of adhesion of a solid, liquid, or gas which deteriorates withstand voltage or surface resistivity.
Pollution Degree 1:	Applies to closed atmospheres (with no, or only dry, non-conductive pollution).
Pollution Degree 2:	Applies to normal indoor atmospheres (with only non-conductive pollution).

EMC Standard

Emission

Complying Standard: EN55011 Group 1 Class A

This product is a Class A (for commercial environment) product. Operation of this product in a residential area may cause radio interference in which case the user is required to correct the interference.

Immunity

Complying Standard: EN61326 Industrial Environment

Maximum Measuring Input Cable Length: 30 m

Basic Operating Conditions

Ambient temperature: 23±5 °C, ambient humidity: 50±10% RH,

Supply voltage/frequency error: Within 1% of rating, and after the warm-up time has passed

Warm-up Time

At least 30 minutes

Operating Conditions

Same as those of the measuring station

Storage Conditions

Temperature: –20 °C to 60 °C

Humidity: 20% to 80%RH

Power Consumption

5 VA (typical value* at 100 V/50 Hz)

Weight

Approx. 0.7 kg

External Dimensions

Approx. 33(W) × 243(H) × 232(D) mm (projections excluded)

Number of Used Slots

1

Standard Accessories

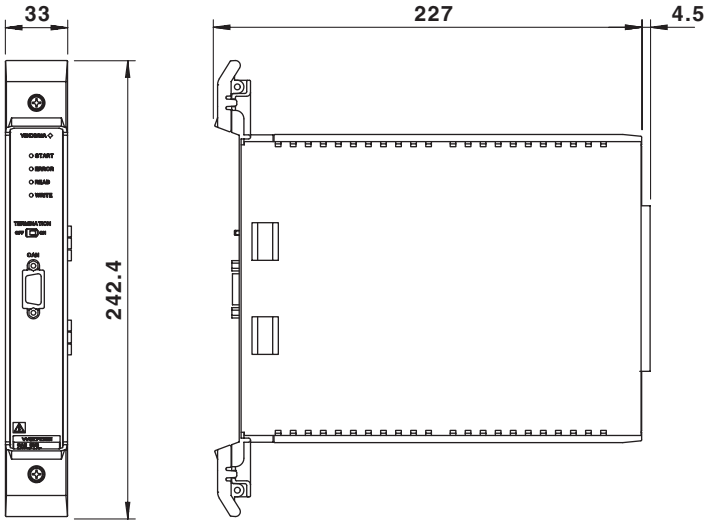
User's Manual (this manual) (1)

* The typical value is a representative or standard value. It is not a warranted value.

4.5 Dimensional Drawings

Unit: mm

WE7081 CAN BUS INTERFACE Module



If not specified, the tolerance is ±3%. However, in cases of less than 10 mm, the tolerance is ±0.3 mm.

Appendix 1 Sample Point Table

The rows that are shaded in gray in the table are the default settings for each bit rate.

Bit Rate = 1 Mbps

No.	Sample Point Value [%]	Time Quanta	BTR0	BTR1
1	83.33	12	40	18
2	75.00	12	40	27
3	66.67	12	40	36
4	58.33	12	40	45
5	50.00	12	40	54

Bit Rate = 800 kbps

No.	Sample Point Value [%]	Time Quanta	BTR0	BTR1
1	86.67	15	40	1B
2	80.00	15	40	2A
3	73.33	15	40	39
4	66.67	15	40	48
5	60.00	15	40	57
6	53.33	15	40	66

Bit Rate = 500 kbps

No.	Sample Point Value [%]	Time Quanta	BTR0	BTR1
1	70.83	24	40	6F
2	66.67	24	40	7E
3	83.33	12	41	18
4	75.00	12	41	27
5	66.67	12	41	36
6	58.33	12	41	45
7	50.00	12	41	54
8	75.00	8	42	14
9	62.50	8	42	23
10	50.00	8	42	32

Bit Rate = 250 kbps

No.	Sample Point Value [%]	Time Quanta	BTR0	BTR1
1	70.83	24	41	6F
2	66.67	24	41	7E
3	87.50	16	42	1C
4	81.25	16	42	2B
5	75.00	16	42	3A
6	68.75	16	42	49
7	62.50	16	42	58
8	56.25	16	42	67
9	50.00	16	42	76
10	83.33	12	43	18
11	75.00	12	43	27
12	66.67	12	43	36
13	58.33	12	43	45
14	50.00	12	43	54
15	75.00	8	45	14
16	62.50	8	45	23
17	50.00	8	45	32

Bit Rate = 125 kbps

No.	Sample Point Value [%]	Time Quanta	BTR0	BTR1
1	70.83	24	43	6F
2	66.67	24	43	7E
3	87.50	16	45	1C
4	81.25	16	45	2B
5	75.00	16	45	3A
6	68.75	16	45	49
7	62.50	16	45	58
8	56.25	16	45	67
9	50.00	16	45	76
10	83.33	12	47	18
11	75.00	12	47	27
12	66.67	12	47	36
13	58.33	12	47	45
14	50.00	12	47	54
15	75.00	8	4B	14
16	62.50	8	4B	23
17	50.00	8	4B	32

Bit Rate = 100 kbps

No.	Sample Point Value [%]	Time Quanta	BTR0	BTR1
1	70.83	24	44	6F
2	66.67	24	44	7E
3	85.00	20	45	2F
4	80.00	20	45	3E
5	75.00	20	45	4D
6	70.00	20	45	5C
7	65.00	20	45	6B
8	60.00	20	45	7A
9	86.67	15	47	1B
10	80.00	15	47	2A
11	73.33	15	47	39
12	66.67	15	47	48
13	60.00	15	47	57
14	53.33	15	47	66
15	83.33	12	49	18
16	75.00	12	49	27
17	66.67	12	49	36
18	58.33	12	49	45
19	50.00	12	49	54
20	80.00	10	4B	16
21	70.00	10	4B	25
22	60.00	10	4B	34
23	50.00	10	4B	43
24	75.00	8	4E	14
25	62.50	8	4E	23
26	50.00	8	4E	32

Bit Rate = 83.3 kbps

No.	Sample Point Value [%]	Time Quanta	BTR0	BTR1
1	70.83	24	45	6F
2	66.67	24	45	7E
3	88.89	18	47	1E
4	83.33	18	47	2D
5	77.78	18	47	3C
6	72.22	18	47	4B
7	66.67	18	47	5A
8	61.11	18	47	69
9	55.56	18	47	78
10	87.50	16	48	1C
11	81.25	16	48	2B
12	75.00	16	48	3A
13	68.75	16	48	49
14	62.50	16	48	58
15	56.25	16	48	67
16	50.00	16	48	76

17	83.33	12	4B	18
18	75.00	12	4B	27
19	66.67	12	4B	36
20	58.33	12	4B	45
21	50.00	12	4B	54
22	77.78	9	4F	15
23	66.67	9	4F	24
24	55.56	9	4F	33
25	75.00	8	51	14
26	62.50	8	51	23
27	50.00	8	51	32

Bit Rate = 62.5 kbps

No.	Sample Point Value [%]	Time Quanta	BTR0	BTR1
1	70.83	24	47	6F
2	66.67	24	47	7E
3	87.50	16	4B	1C
4	81.25	16	4B	2B
5	75.00	16	4B	3A
6	68.75	16	4B	49
7	62.50	16	4B	58
8	56.25	16	4B	67
9	50.00	16	4B	76
10	83.33	12	4F	18
11	75.00	12	4F	27
12	66.67	12	4F	36
13	58.33	12	4F	45
14	50.00	12	4F	54
15	75.00	8	57	14
16	62.50	8	57	23
17	50.00	8	57	32

Bit Rate = 50 kbps

No.	Sample Point Value [%]	Time Quanta	BTR0	BTR1
1	70.83	24	49	6F
2	66.67	24	49	7E
3	85.00	20	4B	2F
4	80.00	20	4B	3E
5	75.00	20	4B	4D
6	70.00	20	4B	5C
7	65.00	20	4B	6B
8	60.00	20	4B	7A
9	87.50	16	4E	1C
10	81.25	16	4E	2B
11	75.00	16	4E	3A
12	68.75	16	4E	49
13	62.50	16	4E	58
14	56.25	16	4E	67
15	50.00	16	4E	76
16	86.67	15	4F	1B
17	80.00	15	4F	2A
18	73.33	15	4F	39
19	66.67	15	4F	48
20	60.00	15	4F	57
21	53.33	15	4F	66
22	83.33	12	53	18
23	75.00	12	53	27
24	66.67	12	53	36
25	58.33	12	53	45
26	50.00	12	53	54
27	80.00	10	57	16
28	70.00	10	57	25
29	60.00	10	57	34
30	50.00	10	57	43
31	75.00	8	5D	14
32	62.50	8	5D	23
33	50.00	8	5D	32

Bit Rate = 33.3 kbps

No.	Sample Point Value [%]	Time Quanta	BTR0	BTR1
1	70.83	24	4E	6F
2	66.67	24	4E	7E
3	85.00	20	51	2F
4	80.00	20	51	3E
5	75.00	20	51	4D
6	70.00	20	51	5C
7	65.00	20	51	6B
8	60.00	20	51	7A
9	88.89	18	53	1E
10	83.33	18	53	2D
11	77.78	18	53	3C
12	72.22	18	53	4B
13	66.67	18	53	5A
14	61.11	18	53	69
15	55.56	18	53	78
16	86.67	15	57	1B
17	80.00	15	57	2A
18	73.33	15	57	39
19	66.67	15	57	48
20	60.00	15	57	57
21	53.33	15	57	66
22	83.33	12	5D	18
23	75.00	12	5D	27
24	66.67	12	5D	36
25	58.33	12	5D	45
26	50.00	12	5D	54
27	80.00	10	63	16
28	70.00	10	63	25
29	60.00	10	63	34
30	50.00	10	63	43
31	77.78	9	67	15
32	66.67	9	67	24
33	55.56	9	67	33
34	75.00	8	6C	14
35	62.50	8	6C	23
36	50.00	8	6C	32

Bit Rate = 20 kbps

No.	Sample Point Value [%]	Time Quanta	BTR0	BTR1
1	68.00	25	57	7F
2	70.83	24	58	6F
3	66.67	24	58	7E
4	85.00	20	5D	2F
5	80.00	20	5D	3E
6	75.00	20	5D	4D
7	70.00	20	5D	5C
8	65.00	20	5D	6B
9	60.00	20	5D	7A
10	86.67	15	67	1B
11	80.00	15	67	2A
12	73.33	15	67	39
13	66.67	15	67	48
14	60.00	15	67	57
15	53.33	15	67	66
16	83.33	12	71	18
17	75.00	12	71	27
18	66.67	12	71	36
19	58.33	12	71	45
20	50.00	12	71	54
21	80.00	10	7B	16
22	70.00	10	7B	25
23	60.00	10	7B	34
24	50.00	10	7B	43

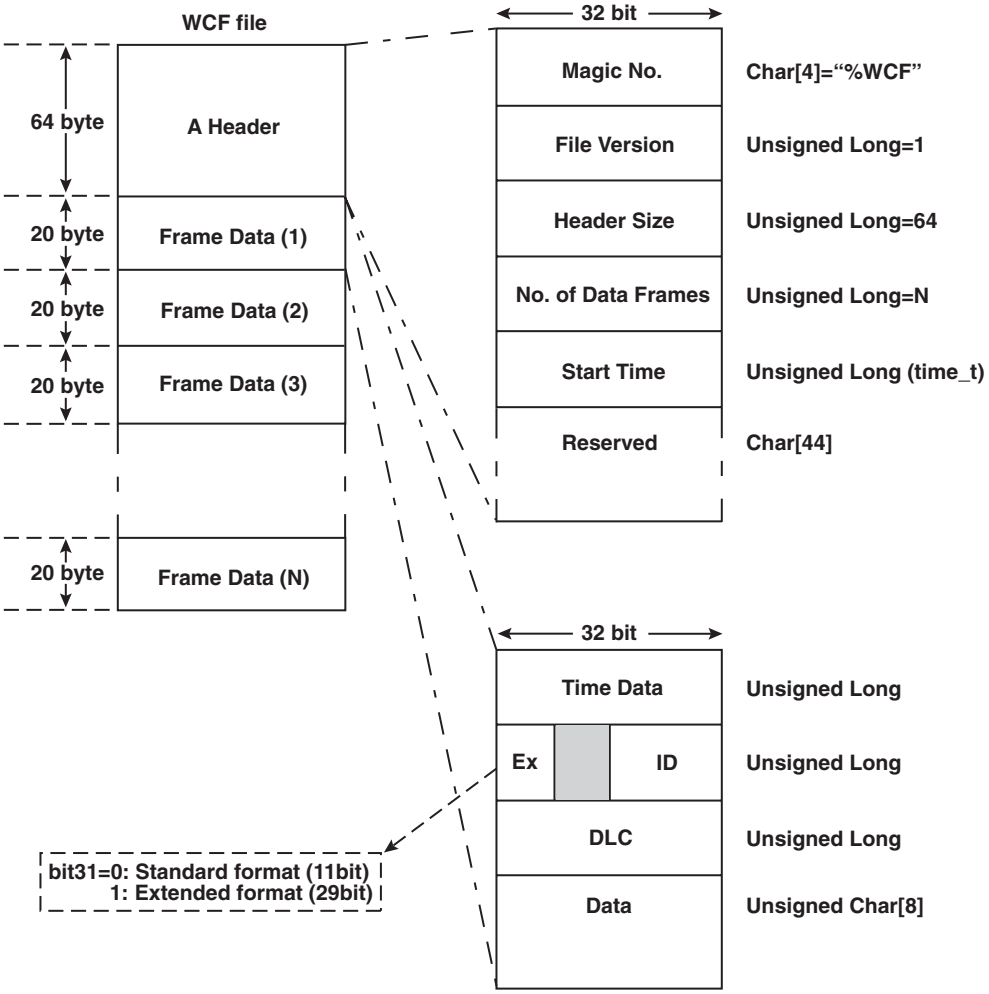
Bit Rate = 10 kbps

No.	Sample Point Value [%]	Time Quanta	BTR0	BTR1
1	68.00	25	6F	7F
2	70.83	24	71	6F
3	66.67	24	71	7E
4	85.00	20	7B	2F
5	80.00	20	7B	3E
6	75.00	20	7B	4D
7	70.00	20	7B	5C
8	65.00	20	7B	6B
9	60.00	20	7B	7A

Appendix 2 Data Structure of Files

DATA Structure of WCF Files

The WCF file is a binary file with a structure shown in the figure below. The Endian is big. Therefore, when directly processing a WCF file on a PC with Intel or compatible CPU, the byte order must be swapped.



DATA Structure of CSV Files

The CSV file is a comma-separated text file with the syntax shown in the figure below.

Line	Description (d and x indicate decimal and hexadecimal notations, respectively)	
1	File Virsion, 1	Header section
2	No.of Data Frames, dddd	
3	Year/Month/Day, dddd/dd/dd	
4	Hour:Min:Sec, dd:dd:dd	
5		← Blank line
6	Time, Format, ID, DLC, Data	← Data block title line
7	ddd.dddd, d, d, xx xx xx xx xx xx xx xx	Data block
8	ddd.dddd, d, d, xx xx xx xx xx xx xx xx	
9	ddd.dddd, d, d, xx xx xx xx xx xx xx xx	
:	:	
N	ddd.dddd, d, d, xx xx xx xx xx xx xx xx	

Appendix 3 Error Codes

The module displays the detected errors in an error log. The following error types and detailed codes are available.

Error Type	Detailed Code (Hex)	Description
Queuing buffer full.	01 02	Input queue overflow Output queue overflow
Overrun.	None	Overrun
Arbitration lost.	See the detailed codes of arbitration lost	Arbitration lost
Bus error.	See the detailed codes of bus error	Bus error
Bus off.	None	Bus cutoff

Detailed Code of Arbitration Lost

Code (Hex)	Lost Bit
00	bit 1 of ID
01	bit 2 of ID
02	bit 3 of ID
03	bit 4 of ID
04	bit 5 of ID
05	bit 6 of ID
06	bit 7 of ID
07	bit 8 of ID
08	bit 9 of ID
09	bit 10 of ID
0A	bit 11 of ID
0B	bit SRTR *1
0C	bit IDE
0D	bit 12 of ID *2
0E	bit 13 of ID *2
0F	bit 14 of ID *2
10	bit 15 of ID *2
11	bit 16 of ID *2
12	bit 17 of ID *2
13	bit 18 of ID *2
14	bit 19 of ID *2
15	bit 20 of ID *2
16	bit 21 of ID *2
17	bit 22 of ID *2
18	bit 23 of ID *2
19	bit 24 of ID *2
1A	bit 25 of ID *2
1B	bit 26 of ID *2
1C	bit 27 of ID *2
1D	bit 28 of ID *2
1E	bit 29 of ID *2
1F	bit RTR *2

*1 RTR bit of the standard frame
*2 Extended frame only

Detailed Codes of Bus Error

Bit Number	Item	Code (Bin): Description
0 to 4	Segment	00010 : ID.28 to ID.21 00011 : start of frame 00100 : bit SRTR 00101 : bit IDE 00110 : ID.20 to ID.18 00111 : ID.17 to ID.13 01000 : CRC sequence 01001 : reserve bit 0 01010 : data field 01011 : data length code 01100 : bit RTR 01101 : reserve bit 1 01110 : ID.4 to ID.0 01111 : ID.12 to ID.5 10001 : active error flag 10010 : intermission 10011 : tolerate dominant bit 10110 : passive error flag 10111 : error delimiter 11000 : CRC delimiter 11001 : acknowledge slot 11010 : end of frame 11011 : acknowledge delimiter 11100 : overload flag
5	Direction	0 : Occurred during transmission 1 : Occurred during reception
6 to 7	Error code	00 : bit error 01 : form error 10 : stuff error 11 : other type of error

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