

DX100 SPEED REDUCER LIFE DIAGNOSIS FUNCTION INSTRUCTIONS

SPECIFICATIONS FOR OPERATING JOB

Upon receipt of the product and prior to initial operation, read these instructions thoroughly, and retain for future reference.

MOTOMAN INSTRUCTIONS

MOTOMAN--□□□ INSTRUCTIONS
DX100 INSTRUCTIONS
DX100 OPERATOR'S MANUAL
DX100 MAINTENANCE MANUAL

The DX100 Operator's manual above corresponds to specific usage.
Be sure to use the appropriate manual.

Part Number: 167573-1CD
Revision: 0



MANDATORY

- This manual explains the Speed Reducer's Life Diagnostic Function of DX100. Read this manual carefully and be sure to understand its contents before handling the DX100.
- General items related to safety are listed in Chapter 1: Safety of the DX100 Instructions. To ensure correct and safe operation, carefully read the DX100 Instructions before reading this manual.



CAUTION

- Some drawings in this manual are shown with the protective covers or shields removed for clarity. Be sure all covers and shields are replaced before operating this product.
- The drawings and photos in this manual are representative examples and differences may exist between them and the delivered product.
- YASKAWA may modify this model without notice when necessary due to product improvements, modifications, or changes in specifications. If such modification is made, the manual number will also be revised.
- If your copy of the manual is damaged or lost, contact a YASKAWA representative to order a new copy. The representatives are listed on the back cover. Be sure to tell the representative the manual number listed on the front cover.
- YASKAWA is not responsible for incidents arising from unauthorized modification of its products. Unauthorized modification voids your product's warranty.

Notes for Safe Operation

Read this manual carefully before installation, operation, maintenance, or inspection of the DX100.

In this manual, the Notes for Safe Operation are classified as "WARNING", "CAUTION", "MANDATORY", or "PROHIBITED".



WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury to personnel.



CAUTION

Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury to personnel and damage to equipment. It may also be used to alert against unsafe practices.



MANDATORY

Always be sure to follow explicitly the items listed under this heading.



PROHIBITED

Must never be performed.

Even items described as "CAUTION" may result in a serious accident in some situations.

At any rate, be sure to follow these important items



To ensure safe and efficient operation at all times, be sure to follow all instructions, even if not designated as "CAUTION" and "WARNING".



WARNING

- Before operating the manipulator, check that servo power is turned OFF pressing the emergency stop buttons on the front door of the DX100 and the programming pendant. When the servo power is turned OFF, the SERVO ON LED on the programming pendant is turned OFF.

Injury or damage to machinery may result if the emergency stop circuit cannot stop the manipulator during an emergency. The manipulator should not be used if the emergency stop buttons do not function.

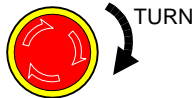
Figure 1: Emergency Stop Button



- Once the emergency stop button is released, clear the cell of all items which could interfere with the operation of the manipulator. Then turn the servo power ON.

Injury may result from unintentional or unexpected manipulator motion.

Figure 2: Release of Emergency Stop



- Observe the following precautions when performing teaching operations within the P-point maximum envelope of the manipulator:
 - View the manipulator from the front whenever possible.
 - Always follow the predetermined operating procedure.
 - Keep in mind the emergency response measures against the manipulator's unexpected motion toward you.
 - Ensure that you have a safe place to retreat in case of emergency.

Improper or unintended manipulator operation may result in injury.

- Confirm that no person is present in the P-point maximum envelope of the manipulator and that you are in a safe location before:
 - Turning ON the power for the DX100.
 - Moving the manipulator with the programming pendant.
 - Running the system in the check mode.
 - Performing automatic operations.

Injury may result if anyone enters the P-point maximum envelope of the manipulator during operation. Always press an emergency stop button immediately if there is a problem. The emergency stop buttons are located on the right of the front door of the DX100 and the programming pendant.

**CAUTION**

- Perform the following inspection procedures prior to conducting manipulator teaching. If problems are found, repair them immediately, and be sure that all other necessary processing has been performed.
 - Check for problems in manipulator movement.
 - Check for damage to insulation and sheathing of external wires.
- Always return the programming pendant to the hook on the DX100 cabinet after use.

The programming pendant can be damaged if it is left in the manipulator's work area, on the floor, or near fixtures.

- Read and understand the Explanation of Warning Labels in the DX100 Instructions before operating the manipulator:

Definition of Terms Used Often in This Manual


The MOTOMAN is the YASKAWA industrial robot product.

The MOTOMAN usually consists of the manipulator, the controller, the programming pendant, and supply cables.

In this manual, the equipment is designated as follows:

Equipment	Manual Designation
DX100 controller	DX100
DX100 programming pendant	Programming pendant
Cable between the manipulator and the controller	Manipulator cable

Descriptions of the programming pendant, buttons, and displays are shown as follows:

Equipment		Manual Designation
Programming Pendant	Character Keys	The keys which have characters printed on them are denoted with []. ex. [ENTER]
	Symbol Keys	The keys which have a symbol printed on them are not denoted with [] but depicted with a small picture. ex. page key  The cursor key is an exception, and a picture is not shown.
	Axis Keys Number Keys	"Axis Keys" and "Number Keys" are generic names for the keys for axis operation and number input.
	Keys pressed simultaneously	When two keys are to be pressed simultaneously, the keys are shown with a "+" sign between them, ex. [SHIFT]+[COORD]
	Displays	The menu displayed in the programming pendant is denoted with { }. ex. {JOB}

Description of the Operation Procedure

In the explanation of the operation procedure, the expression "Select •••" means that the cursor is moved to the object item and the SELECT key is pressed, or that the item is directly selected by touching the screen.

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Speed Reducer Specs for Operating Job	1	Speed reducer Life Diagnosis Function
	1.1	Diagnosis Principle

1 Speed reducer Life Diagnosis Function

The Speed Reducer Life Diagnosis Function is a life span diagnosing function by analyzing the data from the database. When the manipulator's motor of each axes is rotated, the running torque data is saved in the database.

This instruction manual explains the necessary settings and the relevant information of this function.

1.1 Diagnosis Principle

1.1.1 Torque Average Value

Monitor the torque waveform while the JOB is executed and extract oscillatory waveform arising from the speed reducer only from the torque, then calculate the average value of oscillation amplitude.

This database is called torque average value and it is recognized as a basic data for the life span diagnosis.

1.1.2 Speed Reducer Diagnosing Database

To conduct the life span diagnosis, it is necessary to recognize the torque average value by the periodical measurement of the torque average value. To do so, this function can save the daily measurement result in the database.

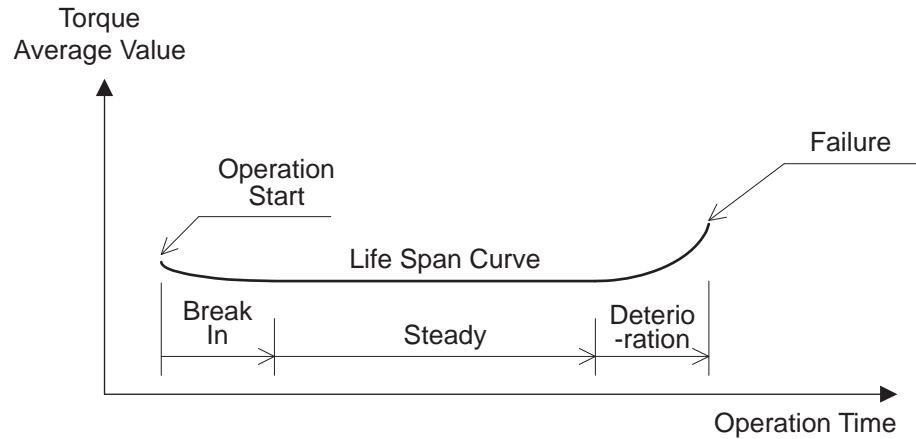
This database is called speed reducer diagnosing database.

This database saves the part of collected results as well as the measurement result. The data recorded in this database can be loaded/saved by using the external memory devices.

1.1.3 Diagnosing Methods

The life span curve shows the correlation between the torque average value and its operating time.

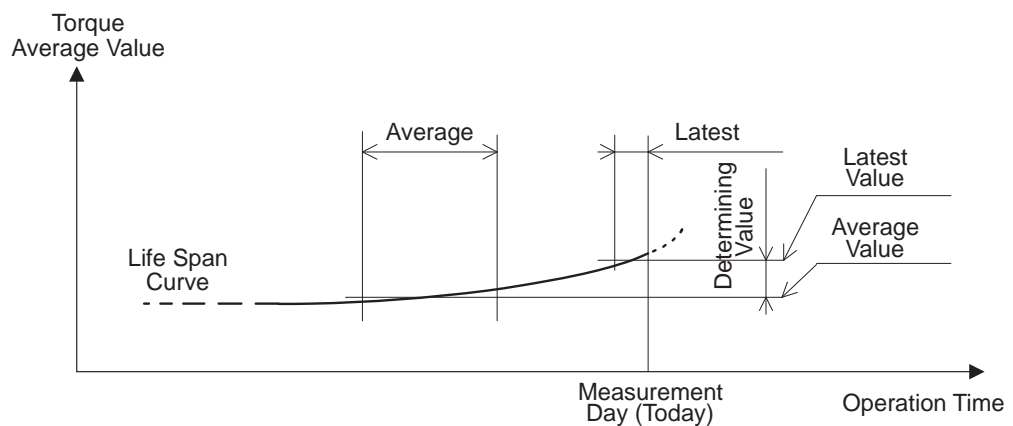
Fig. 1-1: Life Span Curve



As the state of the speed reducer changes 'Break In' → 'Steady' → 'Deterioration', the torque average value changes 'Decrease' → 'Steady' → 'Increase'. This means, when the torque average value is increasing, the speed reducer can be diagnosed as in the deterioration period and about to fail.

The items to be checked to assume the tendency of the torque average value are shown below.

Fig. 1-2: Detecting Principle



The objective periods for the verification are defined as follows.

Latest : The past fixed period including the measurement day.

Average : The past fixed period before the nearest period, the measurement day as a reference.

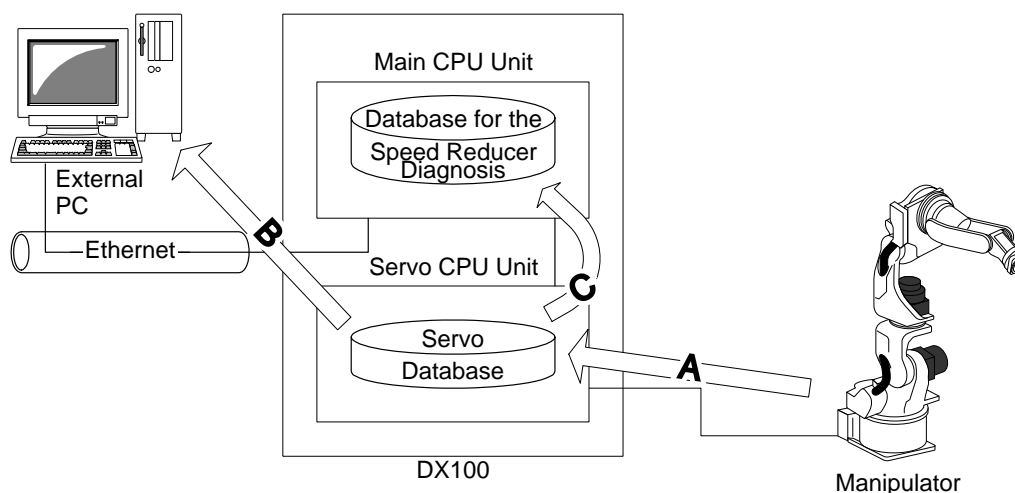
Measure the average within above mentioned each data and calculate the respective latest and average values. The value calculate by the latest value - the average value is recognized as the determining value. When this value increases more than the fixed value, it alarms to notify that the speed reducer is going to fail soon.

1.2 System Outline

The Speed Reducer Life Diagnosis Function consists of software solitary and doesn't need any special hardware.

The software itself consists of three sub functions shown below.

Fig. 1-3: Function Configuration



1.2.1 Torque Data Collecting Function

This function monitors the torque data of each axes, extracts the torque average value, and saves them in the servo database.

This function is shown as "A" in *Fig. 1-3 Function Configuration on page 1-3*.

1.2.2 Torque Data Transmitting Function

This function transmits the torque average value in the servo database to the external PC. It is used when making an in-depth analysis by the external PC originally.

This function is shown as "B" in *Fig. 1-3 Function Configuration on page 1-3*.

1.2.3 Updating/Analyzing Function of The Speed Reducer Diagnosis Data Base

This function updates the Speed Reducer Diagnosis database by the torque average value in the servo database. Furthermore, it can analyze its cumulative data. Also, it shows the result of the analysis on the programming pendant window or it outputs the signal as an alarm when diagnosed as the failure.

This function is shown as "C" in *Fig. 1-3 Function Configuration on page 1-3*.

1.3 Applicable Version

The Speed Reducer Diagnosis Function (Specifications for Operating JOB) is applicable from version No. : DS1.50.00A(**)-00.

As for the application to other versions, contact your Yaskawa representative.

2 The Settings of the Speed Reducer Life Diagnosis Function

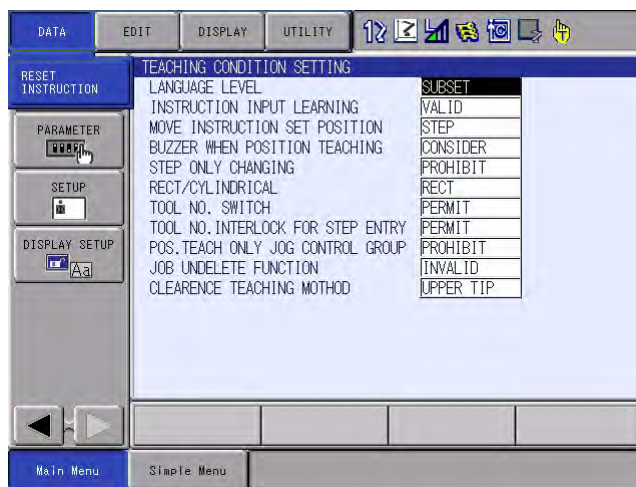
To utilize the Speed Reducer Life Diagnosis Function, please follow the setting methods shown in this section.

2.1 The Speed Reducer Life Diagnosis Function Settings

Validate the parameter of The Speed Reducer Life Diagnosis Function. (The customer is not allowed to change this parameter. As for its settings, contact your Yaskawa representative.)

After validating this parameter, initialize the instruction with the following procedures.

1. Change the security mode to the "Management Mode".
2. Select {SETUP} under the main menu
 - The sub menu appears.
3. Select {TEACHING COND}.
 - The teaching condition window appears.
4. Select {DATA}.
 - The pull-down menu appears.



5. Select {RESET INSTRUCTION}.
 - The confirmation dialog box appears.
6. Select [YES].
 - Instruction is initialized.

2.2 Ethernet Settings

The torque average value can be read from the external PC via ethernet.

When reading, the ethernet setting is required and the FTP function setting is required as the need arises.

For the details of these functions and settings, please refer to Chapter 3 "Ethernet Function Settings" in DX100 OPTIONS INSTRUCTIONS FOR ETHERNET FUNCTION (157130-1CD) and the DX100 OPTIONS INSTRUCTIONS FOR FTP FUNCTION (157178-1CD).

2.3 Creating Measuring Jobs

It is not necessary to make a dedicated JOB for measurement.

Torque average value can be measured by adding the instruction to the JOB actually to be used for production.

In this section, JOB making for the measurement of torque average value will be explained.

2.3.1 Relevant Instructions

When measuring the torque average value, follow the instructions below.

2.3.1.1 MEASON TRQ

“MEASON TRQ” instruction starts the measurement of torque average value.

MEASON (MEASURE · ON)	Function	Start the measurement of torque average value	
	Additional Items	TRQ (Speed Reducer Life Diagnosis setting)	It is compulsory to use it for the speed reducer life diagnosis.
	Sample	MEASON TRQ	

2.3.1.2 MEASOF TRQ/TRQDB

“MEASOF TRQ” instruction finishes the measurement of the torque average value and then, saves the torque average value in the servo database and to the speed reducer diagnosis database. Furthermore, if it is not an acceleration examination, it processes the data in the speed reducer diagnosis database to determine the life span. When operating this instruction, it overwrites the existing data of the day if any so that only one datum per day is accepted for the life diagnosis.

“MEASOF TRQDB” instruction is required only when conducting the acceleration examination.

“MEASOF TRQ” doesn’t process the data of the speed reducer diagnosis database nor determine the life span when conducting an acceleration examination. Instead, “MEASOF TRQDB” dose it.

When operating this instruction, the result data is saved as the latest one at each time. (not the daily data but each data is accepted for the diagnosis). This instruction is valid only when it is an acceleration examination.

MEASOF (MEASURE · OFF)	Function	Finish the torque measurement, save the result to the database and diagnose the life span.	
	Additional Item	TRQ(Speed Reducer Life diagnosis setting) TRQDB(Acceleration examination setting for the Speed Reducer Life Diagnosis)	It is compulsory to use it for the speed reducer life diagnosis.
	Example	MEASOF TRQ MEASOF TRQDB	

2.3.2 Control Group

The DX100 regards singly or plurally organized operational object axis as "Control Group". And it is classified into "Robot", "Base" and "Station".

Classification	Explanation	Designation for the DX100
Robot	Indicate the manipulator itself.	R1, R2, R3, R4, R5, R6, R7, R8
Base	The axis that move the manipulator. It corresponds to Servo truck etc. The robot and the base should be operated by the same numbers. (R1-B1, R2-B2, R3-B3, R4-B4)	B1, B2, B3, B4, B5, B6, B7, B8
Station	The axis other than for the robot and base, instead, in charge of operating and turning the jigs.	S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S11, S12, S13 ... S24

When diagnosing the life of the speed reducer, the measurement can be carried out by any combination of "Robot", "Robot + Base", "Station" or "Robot + Station".

The job without control group cannot operate "MEASON TRQ" instruction.

2.3.3 Control Axis

By executing "MEASON TRQ", the measurement of torque average value of all the axes within the control group will start.

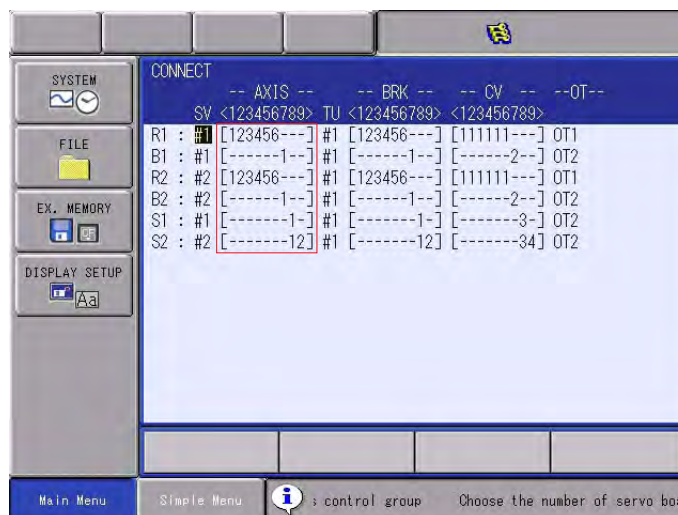
2.3.4 Setting Confirmation of the Control Group and the Control Axis

The registered control groups at present can be confirmed by following procedures.

1. Turn ON the power supply while pressing [MAIN MENU].
 - Maintenance mode starts.
2. Select {SYSTEM} under the main menu.
 - The sub menu appears.
3. Select {SETUP}.
 - The SETUP window appears.
4. Select {CONTROL GROUP}.
 - The CONTROL GROUP window appears.
 - In this window, the setting status of the current control group is indicated. (R1 to R8, B1 to B8, S1 to S24)



5. Press [ENTER].
 - The CONNECT window appears.
 - In this window, the defined control groups and the axis configuration of the control groups are displayed. The axis configurations of each control group are shown within the following frame.



2.3.5 Job Examples

As for the job examples for measurement, the followings are the ones when conducting acceleration examination with R1 (6 axis) + B1 (1 axes) + S1 (2 axis) system.

Monitor the torque waveform of the range that is enclosed with "MEASON TRQ" and "MEASOF" instructions and extract oscillatory waveform arising from the speed reducer from the torque, then calculate the torque average value.

As for the disabled axis, the average value can not be calculated.

When it is not the acceleration examination, the measurement can be executed at both registered/not registered condition since "MEASOF TRQDB" doesn't process it. (The results don't change.)

Job "MASTER" (No Control Group)	Explanation
<pre> NOP CALL JOB :JOB1 CALL JOB :JOB2 MEASOF TRQDB END </pre>	<pre> Execute JOB1 Execute JOB2 Processing the database (Effective only when acceleration examination) </pre>
Job "JOB1" (Control Group : R1+B1)	Explanation
<pre> NOP MEASON TRQ MOVJ VJ=100.0 MOVJ VJ=100.0 : MOVJ VJ=100.0 MOVJ VJ=100.0 MEASOF END </pre>	<pre> Start measuring the torque average value of all axes of R1 and B1. } C :rate all axes of R1. C :rate all axes of B1. } End measuring the torque average value of all axes of R1 and B1. </pre>
Job "JOB2" (Control Group : S1)	Explanation
<pre> NOP MEASON TRQ MOVJ VJ=100.0 MOVJ VJ=100.0 : MOVJ VJ=100.0 MOVJ VJ=100.0 MEASOF END </pre>	<pre> Start measuring the torque average value of all axes of S1. } C :rate all axes of S1. } End measuring the torque average value of all axes of S1. </pre>

2.4 Measurement Condition Settings

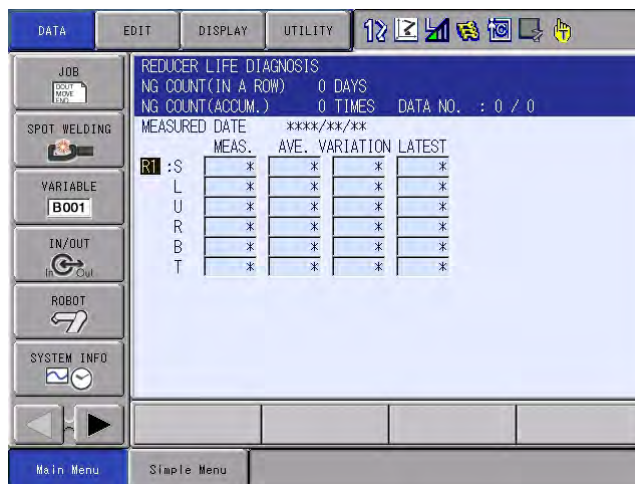
The followings are the setting procedures for the measurement conditions.

2.4.1 Procedure for the Measurement Condition Settings

1. Change the security mode to the management mode.
2. Select {ROBOT} under the main menu.
 - The sub menu appears.

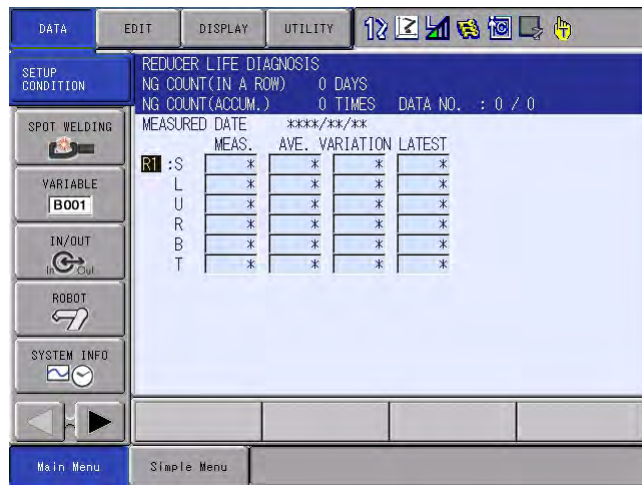


3. Select {REDUCER LIFE DIAG.}.
 - The Speed Reducer Life Diagnosis window appears.



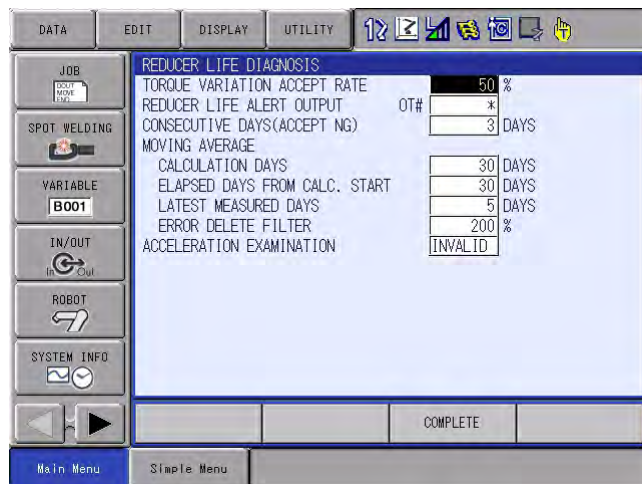
4. Select {DATA}.

- The pull down menu appears.



5. Select {SETUP CONDITION}.

- The SETUP CONDITION window appears.
- Modify the data as needed.



6. Select {COMPLETE}.

- Return to the Speed Reducer Life Diagnosis window.

2.4.2 Details of the Measurement Conditions

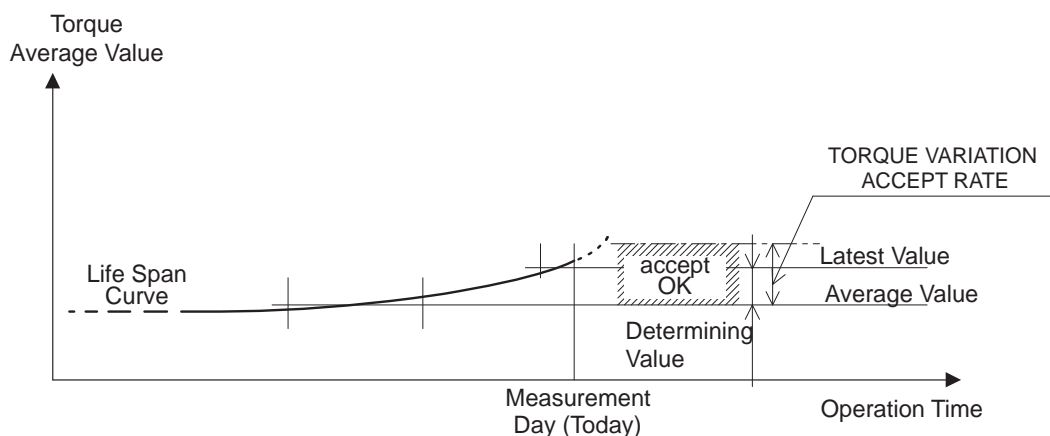
Each measurement condition has the following meanings.

2.4.2.1 TORQUE VARIATION ACCEPT RATE

When the determining value (the latest value - the average value) is the same or smaller than the value set here, it is regarded as accept OK. If it is bigger than the set value, it is accept NG.

The initial value here is 50.

Fig. 2-1: Torque Variation Accept Rate

**2.4.2.2 REDUCER LIVE DIAG. ALERT OUTPUT**

When the continuous number of days that are regarded as accept NG (the latest value - the average value > torque variation accept rate) exceeds the specified number of accept NG days, the general output signal is turned ON. Set 0 when not willing to output the signal.

The initial value here is 0.

2.4.2.3 CONSECUTIVE DAYS (ACCEPT NG)

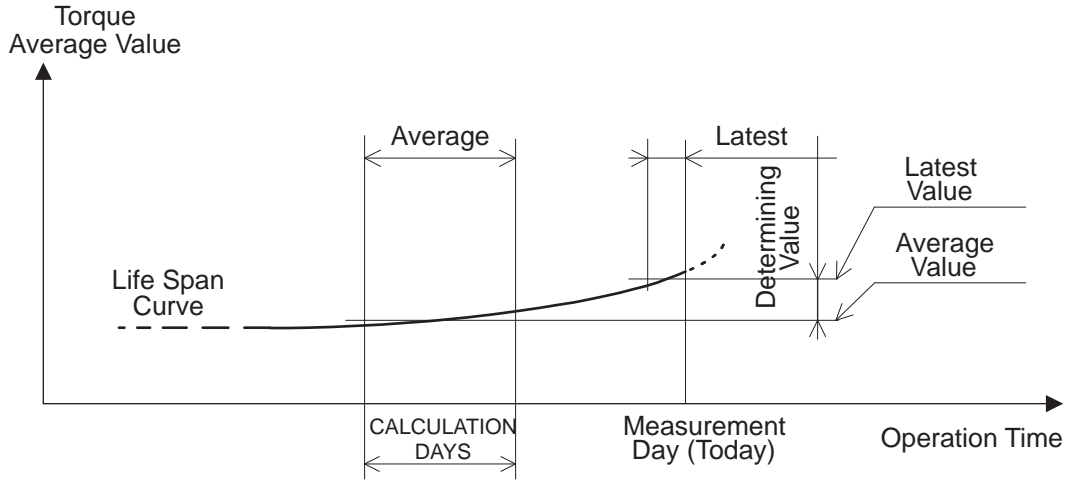
When the number of continuous accept NG (the latest value - the average value > torque variation accept rate) days exceeds the days set here, the life of the speed recudcer is determined to end soon.

The initial value here is 3 (days).

2.4.2.4 CALCULATION DAYS

Set the period to calculate the average value. The initial value here is 30 (days).

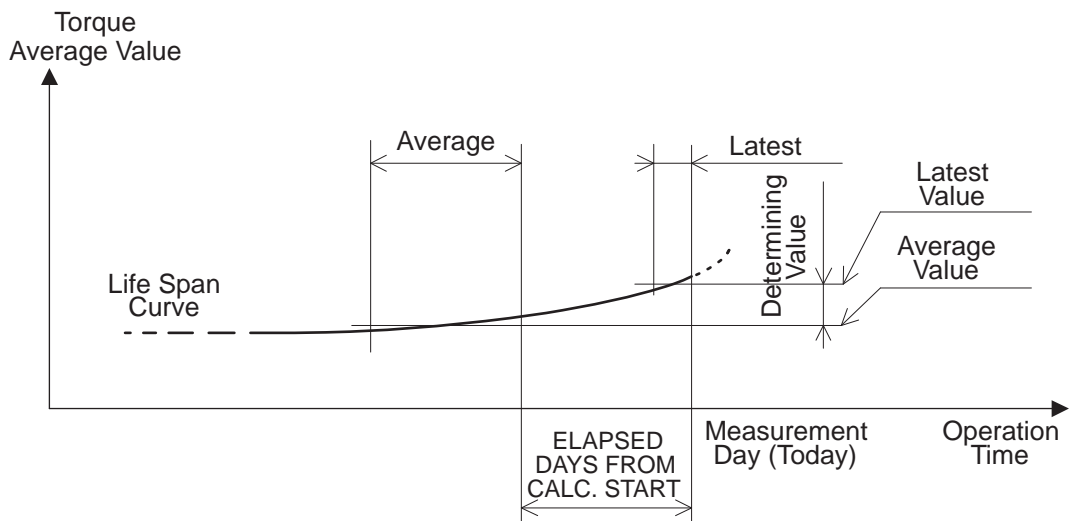
Fig. 2-2: Calculation Days



2.4.2.5 ELAPSED DAYS FROM CALC. START

Set the numbers of day commencing from the measurement day (today) in order to calculate the average value. The initial value here is 30 (days).

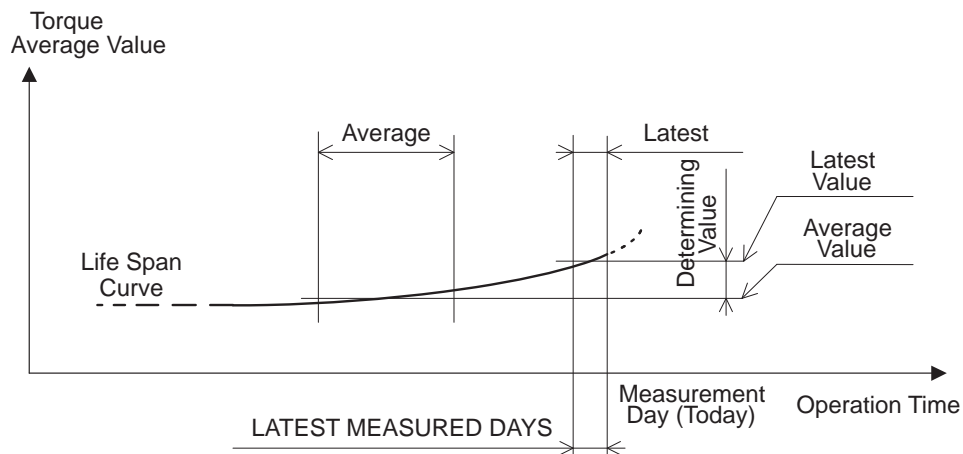
Fig. 2-3: Elapsed Days From CALC. Start



2.4.2.6 LATEST MEASURED DAYS

Set the number of days starting from the measurement day (today) to calculate the latest value. The initial value here is 5 (days).

Fig. 2-4: Latest Measured Days



2.4.2.7 ERROR DELETE FILTER

This filter is for deleting the error values when calculating the average value. The following measured values (torque average value) are eliminated from this calculation.

- When the average value of the previous day exists

The the previous day's average value / Any measured values within average period x 100 > The set value of the deleting filter

Any measured values within average period / The the previous day's average value x 100 > The set value of the deleting filter

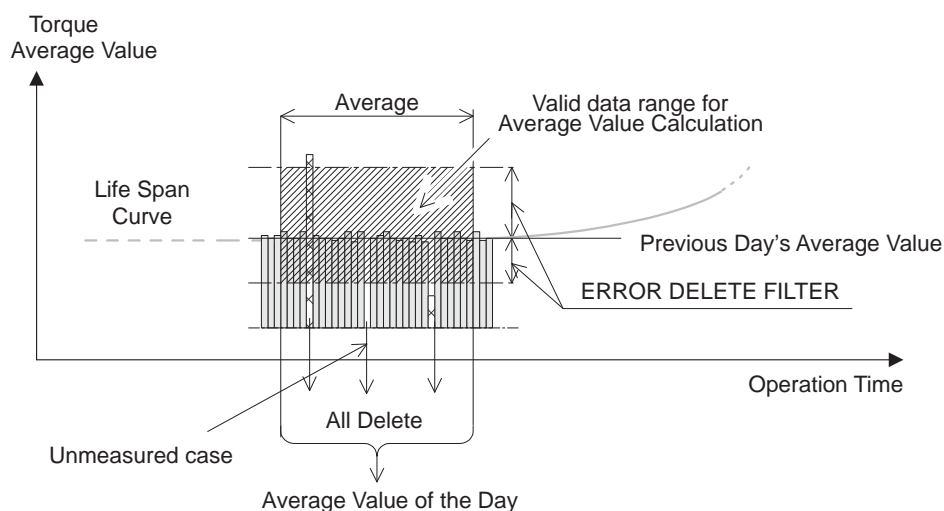
- When the previous day's average value does not exist.
(Before the period set by ELAPSED DAYS FROM CALC.START.)

The latest value / Any measured values within the average period x 100 > The set value of the deleting filter

Any measured values within average period / The latest value x 100 > The set value of the deleting filter

The initial value here is 200 (%).

Fig. 2-5: Error Delete Filter



2.4.2.8 ACCELERATION EXAMINATION

At normal settings, the existing data of the day is overwritten when the speed reducer diagnosis database is upgraded.

This enables us to try the measurement again when failing to it. On the other hand, some cases require to upgrade the speed reducer diagnosis database at each measurement.

In these cases, by setting this function "VALID" and executing "MEASOF TRQDB", the database can be upgraded at each measurement time.

3 Execution of The Speed Reducer Life Diagnosis Function

The followings are the operational manuals of the Speed Reducer Life Diagnosis function.

3.1 Execution of the Measuring Jobs

Execute the measuring job for one cycle.

Determine the life span by saving the torque average value to the servo database and to the reducer diagnosis database. After the reducer life alarm output is set, the signal will be output when the left life span is short.



Execute the measuring job everyday so that the torque average data enough for reducer diagnosis database is saved. If there is no enough data, the appropriate determination might not be conducted.

3.2 Confirmation of The Result

The measured result can be referred as follows.

3.2.1 The Speed Reducer Life Diagnosis Window


The torque average value or the diagnosis are referred by the following procedures.

1. Select {ROBOT} under the main menu.
 - The sub menu appears.



2. Select {REDUCER LIFE DIAG.}.
 - The speed reducer life diagnosis window appears.

REDUCER LIFE DIAGNOSIS				
NG COUNT(IN A ROW)		0 DAYS		
NG COUNT(ACCUM.)		0 TIMES DATA NO. : 1 / 1		
MEASURED DATE 2009/11/25				
	MEAS.	AVE.	VARIATION	LATEST
R1 : S	7	*	*	7
L	5	*	*	5
U	6	*	*	6
R	5	*	*	5
B	6	*	*	6
T	2	*	*	2

3. Press the page key  if necessary.
 - Possible to refer the data of a certain date which corresponds to the

number of times you press the page key .



If there is an axis in which the “MEAS.” shows “*”, the torque average value has not been measured since the moving speed is below the basic speed. In that case, accelerate the moving speed at the measurement or correct the JOB so that the axis operates in more than the basic speed.

Speed Reducer Specs for Operating Job	3 Execution of The Speed Reducer Life Diagnosis Function
	3.2 Confirmation of The Result

The respective items appear in the window have the following meanings.

3.2.1.1 NG COUNT (IN A ROW)

This item means the number of the days that the determination value exceeds TORQUE VARIATION ACCEPT RATE continuously. When this number exceeds CONSECUTIVE DAYS (ACCEPT NG), the speed reducer life alarm is output.

3.2.1.2 NG COUNT (ACCUM.)

This item means the total number of days that the determination value exceeds TORQUE VARIATION ACCEPT RATE. When a day which doesn't exceed TORQUE VARIATION ACCEPT RATE exists, the number of NG COUNT (IN A ROW) returns to 0, however the number of NG COUNT (ACCUM.) will not return to 0.

3.2.1.3 MEASURED DATE

This item means the date when these measurements mentioned on this page are conducted and the speed reducer diagnosis database is updated.

3.2.1.4 MEAS.

This item means the torque average value measured on the measurement day.

3.2.1.5 AVE.

This item means the arithmetical average value within the average period (A certain period of days before the calculating period, measurement day as a reference). However, the deleted value by ERROR DELETE FILTER is not included.

3.2.1.6 VARIATION (The Determining Value)

This item means the difference between the latest value and the average value. When this exceeds the value set by TORQUE VARIATION ACCEPT RATE, it is determined as accept NG.

3.2.1.7 LATEST

This item means the arithmetical average value within latest period (A past certain period of days including the measurement day).

3.2.2 Confirmation by a Graph

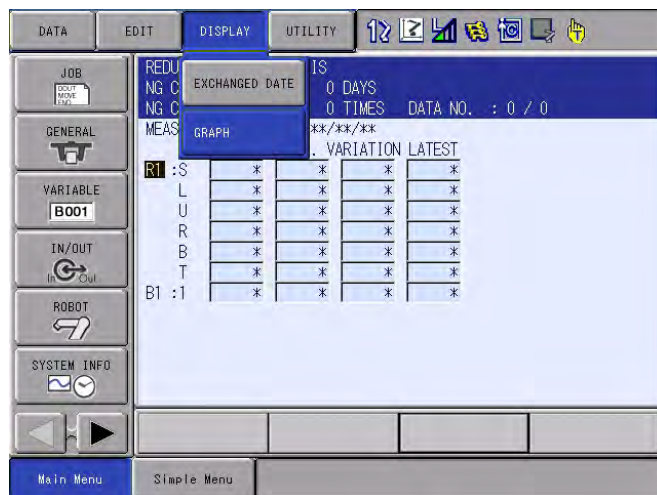
Able to confirm the measured value and the variation by a graph after the measurement. The graph is updated every 24 hours automatically. The measured value and changes of the variation can be displayed on the programming pendant. Thus, able to confirm the changes of the torque visually. Use the graph display as the one of the methods to determine the duration of life for the speed reducer.

“3.2.2 Confirmation by a Graph” is for version DS3.10.00A(**)-00 and later versions.

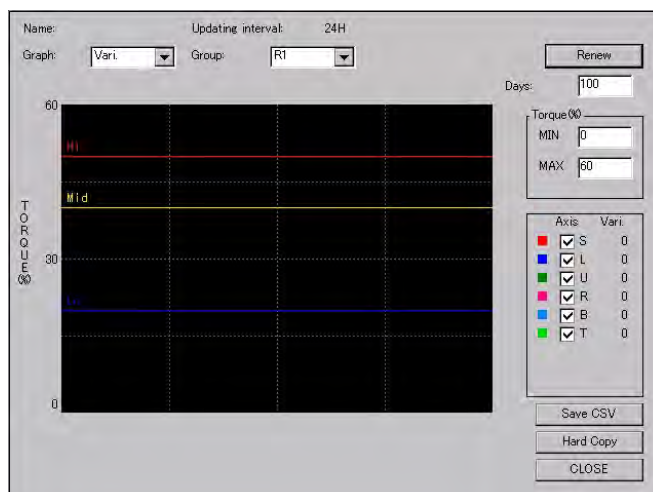
3.2.2.1 Display Method

The graph can be displayed by the following procedures.

1. Select {ROBOT} in the main menu.
 - A sub menu appears.
2. Select {REDUCER LIFE DIAG.}.
 - The speed reducer life diagnosis window appears.
3. Select {DISPLAY}.
 - The pull down menu appears.



4. Select {GRAPH}.
 - The graph appears.



5. Select {CLOSE}.

- Return to the lifetime calculation window.

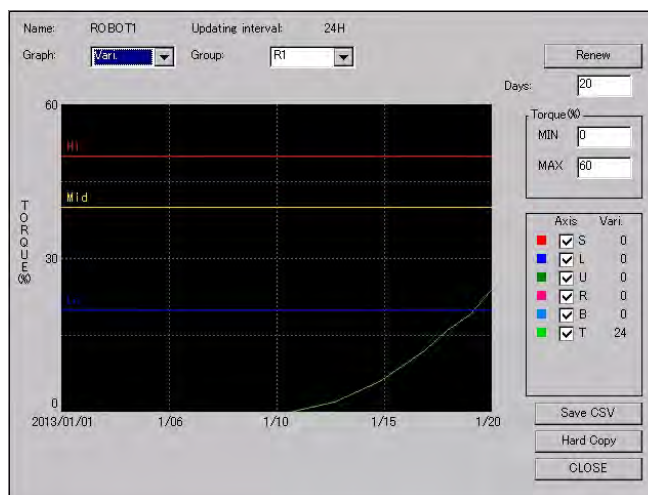
Each item on the screen represents the following description.

■ Graph

Select the {Graph}, and the pull down menu appears. Either “Vari.” or “Meas.” can be selected.

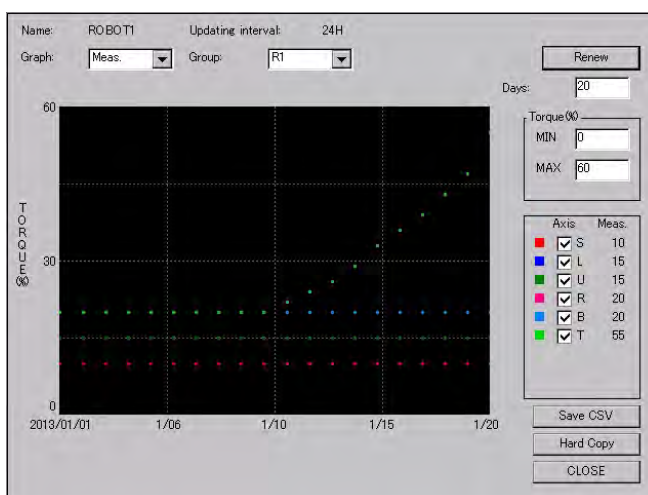
- When selecting “Vari.”, the variation (=latest value - average value) appears on the graph. The lines of each “Hi”, “Mid” and “Lo” appear. “Hi” means “the torque variation accept high”. “Mid” means “the torque variation accept medium”. “Lo” means “the torque variation accept low”.

When changing “the torque variation accept high”, “the torque variation accept medium” or “the torque variation accept low” on the each setting window, the lines for “Hi”, “Mid” and “Lo” on the graph also correspond to the setting values.



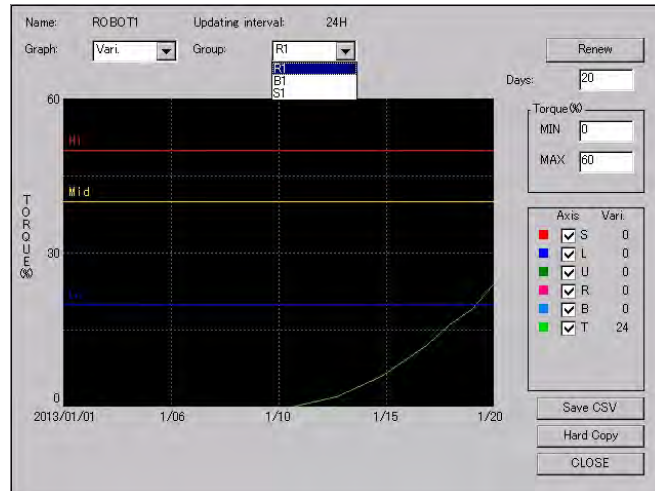
In the case of the graph above, it shows a “variation” > “Lo” of the T-axis, and the warning output signal, which is set by “torque variation low”, is ON.

- When selecting “Meas.”, the measured value is displayed on the graph.



■ Group

Select {Group}, and the pull down menu appears. Select the group to display.



■ Name

The names set in the each setting window are displayed.

■ Days

Set the number of the days between 5 and 150 days to be displayed. The latest data is displayed on the right side of the graph, and the old data set by "Days" is displayed on the left side of the graph.

■ Torque

The minimum value and the maximum value of the vertical axis can be set. "MIN" is the minimum value, and "MAX" is the maximum value.

■ Axis

Removing the tick in the box hides the axis on the screen.

■ Save CSV

Pressing the "CSV" button saves the variation and measured value into the external memory device as CSV format. As for the external device, it can be saved into both CF card and USB, but the data is saved into the CF card as priority. The followings are the name for a file and a folder to be saved.

File name: "the name which is set in the each setting window" + "year/month/day" + "hour/minute/second". csv

Folder name: "SR LIFE DIAGNOSIS"

■ Hard COPY

Pressing the "Hard COPY" button saves the hard copy of the screen as JPG format into the CF card.

The following is the name for the file.

File name: "year/month/day" + "hour/minute/second". JPG

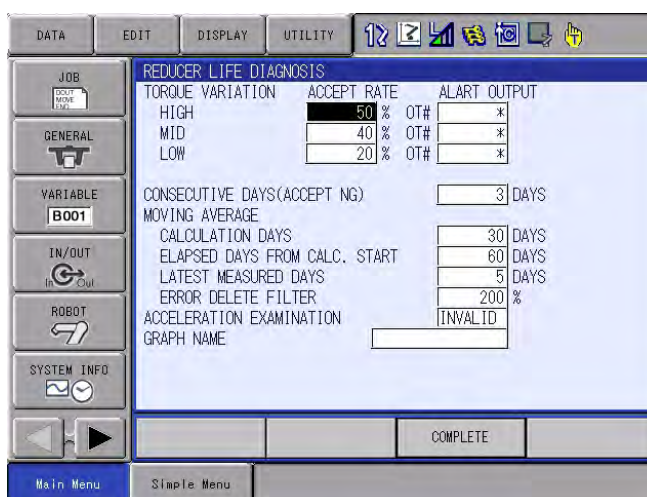
■ CLOSE

Pressing "CLOSE" button closes the graph window.

3.2.2.2 Setting Procedure

The judgement threshold value can be set in three stages.
The procedure is as follows.

1. Change the security mode to the management mode.
2. Select {ROBOT} in the main menu.
 - The sub menu appears.
3. Select {REDUCER LIFE DIAG.}.
 - The speed reducer life diagnosis window appears.
4. Select {DATA}.
 - The pull down menu appears.
5. Select {SETUP CONDITION}.
 - The setup condition window appears.



- **TORQUE VARIATION ACCEPT RATE**
 It is determined as accept OK when the measured value (the latest value - the average value) is smaller than the set value or the equal value. It is determined as accept NG when the measured value is greater than the set value. The torque variation accept rate can be set as "High", "Medium" or "Low". The initial value of each item is 50%, 40% and 20%.
- **TORQUE VARIATION ALART OUTPUT**
 - **ACCEPT RATE HIGH**
 The warning output signal is turned ON when the number of the day ,which is determined as accept NG (the latest value - the average value > "ACCEPT RATE HIGH"), is more than the number of the consecutive days. If unnecessary to output the signal, set the item "0". The initial value of this item is "0".

- **ACCEPT RATE MID, LOW**
The universal output signal, which is set by “ACCEPT RATE MID” and “ACCEPT RATE LOW”, is turned ON when it is determined as follows.
The latest value - the average value > “ACCEPT RATE MID”.
The latest value - the average value > “ACCEPT RATE LOW”.
If unnecessary to output the signal, set the item “0”. The initial value of this item is “0”.
When set a same signal number to HIGH, MID, and LOW, the signal turns ON according to the output condition of HIGH.

■ **Graph Name**

A graph name can be registered.

6. Select {COMPLETE}.

- Return to the speed reducer life diagnosis window.

3.2.3 Acceleration Examination

Conduct the measurement after validating the acceleration examination in the setup condition window of the speed reducer life diagnosis. The each result of “MEASOF TRQDB” is regarded as the latest one and saved in the speed reducer diagnosis database.

When disable the examination, only the last “MEASOF TRQDB” result of the day is saved in the speed reducer diagnosis database as its measured result.

3.2.4 Stop the Alarm Signal Output

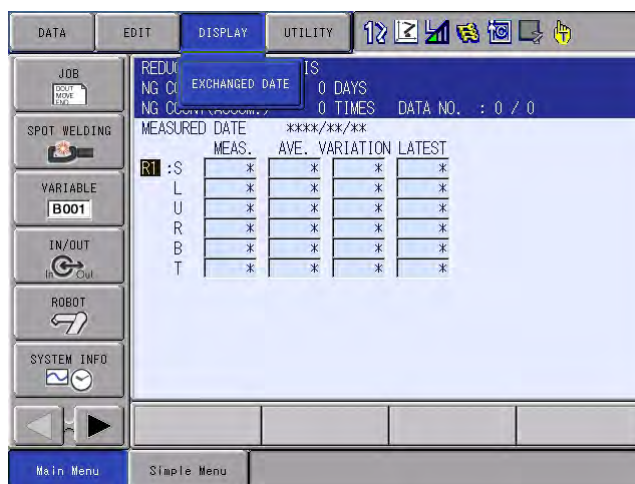
Refer the following procedures to stop the output of speed reducer life diagnosis signal.

1. Change the security mode to the management mode.
2. Select {ROBOT} under the main menu.
 - The sub menu appears.
3. Select {REDUCER LIFE DIAG.}.
 - The Speed Reducer Life Diagnosis window appears.
4. Select {UTILITY}.
 - {RESET LIFE ERROR} appears in the pull down menu when speed reducer life alarm signal is output.
5. Select {RESET LIFE ERROR}.
 - The selected signal output stops.
 - The stopped signal would not appear in the pull down menu even if {UTILITY} is selected.

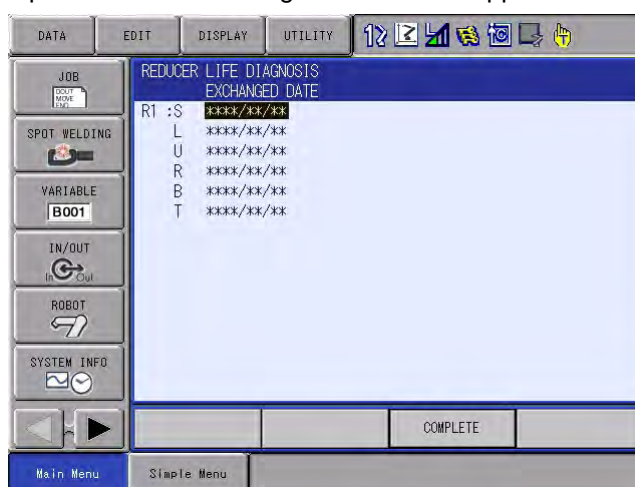
3.2.5 Replacement of the Speed Reducer

When replacing the speed reducer, the previous reducer's data causes the incorrect life diagnosis. To avoid this, the further use of the previous data can be avoided by setting the date of the speed reducer replacement. When setting the date, please refer the following procedures. Although the previous data is no longer needed for its diagnosis, it can be referred continuously.

1. Change the security mode to the management mode.
2. Select {ROBOT} under the main menu.
 - The sub menu appears.
3. Select {REDUCER LIFE DIAG.}.
 - The speed reducer life diagnosis window appears.
4. Select {DISPLAY}.
 - The pull down menu appears.



5. Select {EXCHANGED DATE}
 - The speed reducer exchange date window appears.



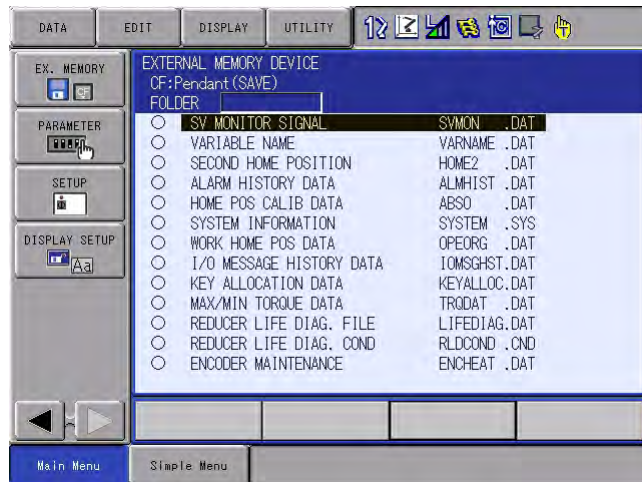
6. Set the date of the speed reducer exchange.
 - Set the speed reducer exchange date with the numeric keys.

4 Data Management

4.1 External Memory

The speed reducer diagnosis database and its measuring conditions are loaded/saved by the external memory menu. Refer to Chapter 7 “External Memory Devices” in the “DX100 OPERATOR’S MANUAL” for the details.

1. Select {EX. MEMORY} under the main menu.
 - The external memory menu appears.
2. Select {LOAD} or {SAVE}.
 - The load or the save window appears.
3. Select {SYSTEM DATA}.
 - The system data selection window appears.
(Mentioned below is the example window when save is selected.)

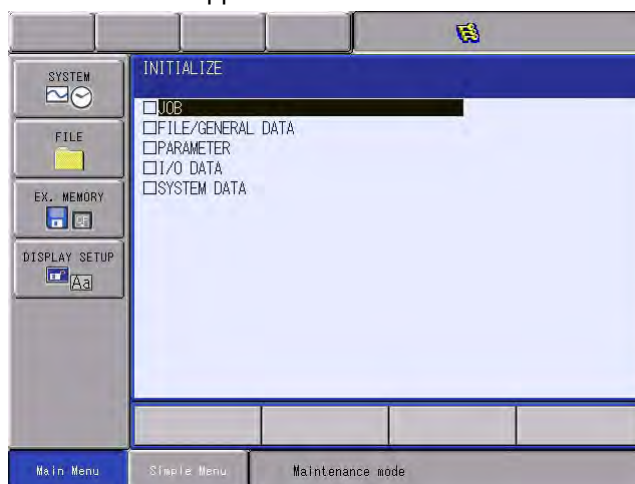


4. Select the system data for loading or saving.
 - Select {REDUCER LIFE DIAG. FILE} in the speed reducer life diagnosis database. Select {REDUCER LIFE DIAG. COND} for the measuring conditions.
 - “★” is displayed to the selected system data.
5. Press [ENTER].
 - A confirmation dialog box appears.
6. Select {YES}.
 - The selected system data is saved.

4.2 Initializing the Data

The speed reducer diagnosis database and its measuring conditions can be initialized by the File menu in maintenance mode.

1. Turn ON the power supply while pressing [MAIN MENU].
 - Maintenance mode is executed.
2. Change the security mode.
 - Change the security mode to the “Management Mode”.
3. Select {FILE} under the main menu.
 - The file menu appears.
4. Select {INITIALIZE}.
 - The initialize menu appears.



5. Select the system data to be initialized.
 - Select {REDUCER LIFE DIAG. FILE} in the speed reducer life diagnosis database. Select {REDUCER LIFE DIAG. FILE} for the measuring conditions.
 - “★” is displayed to the selected system data.



6. Press [ENTER].
 - A confirmation dialog box appears.
7. Select {YES}.
 - The selected data is initialized.

5 Alarm

5.1 Speed Reducer Life Alarm Output

When the left life span of the speed reducer is diagnosed as short, the specified general output signal can be turned ON.

Refer to *Section 2.4 "Measurement Condition Settings"* on page 2-7 for the detailed setting procedures for the general output signal.

And refer *Section 3.2.4 "Stop the Alarm Signal Output"* on page 3-8 for the detailed procedures to stop the output signal.

DX100 OPTIONS SPEED REDUCER LIFE DIAGNOSIS FUNCTION INSTRUCTIONS

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for ongoing product modifications and improvements.