HYUNDAI ROBOTICS

WARNING

INSTALLATION SHOULD ONLY BE PERFORMED BY QUALIFIED INSTALLATION PERSONNEL AND MUST CONFORM TO ALL NATIONAL AND LOCAL CODES.

Hi5a Controller Function Manual

Spot Welder Interface

HD HYUNDAI ROBOTICS

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1 Overview

1.1. What is a welder interface?

It is an integrated control function that enables the Hi5a controller to perform data input, monitoring, and data management of the spot welder using DeviceNet communication between the Hi5a controller and the spot welder.

The robot controller and spot welder are configured as a unit, making it possible to perform data editing and file management in the welding program by using the Hi5a controller teach pendant. The teaching pendant of the robot controller enables the robot controller to perform the main functions of the spot welding controller, such as welding schedule programming, stepper programming, welding result monitoring, and history file.
In other words, the welder interface provides a user interface that allows the robot teach pendant to perform the functions of the teaching box, which is the control panel of an independent welder.
The welder interface makes it possible to display and monitor the welding results, various signals, and the status of errors and faults.

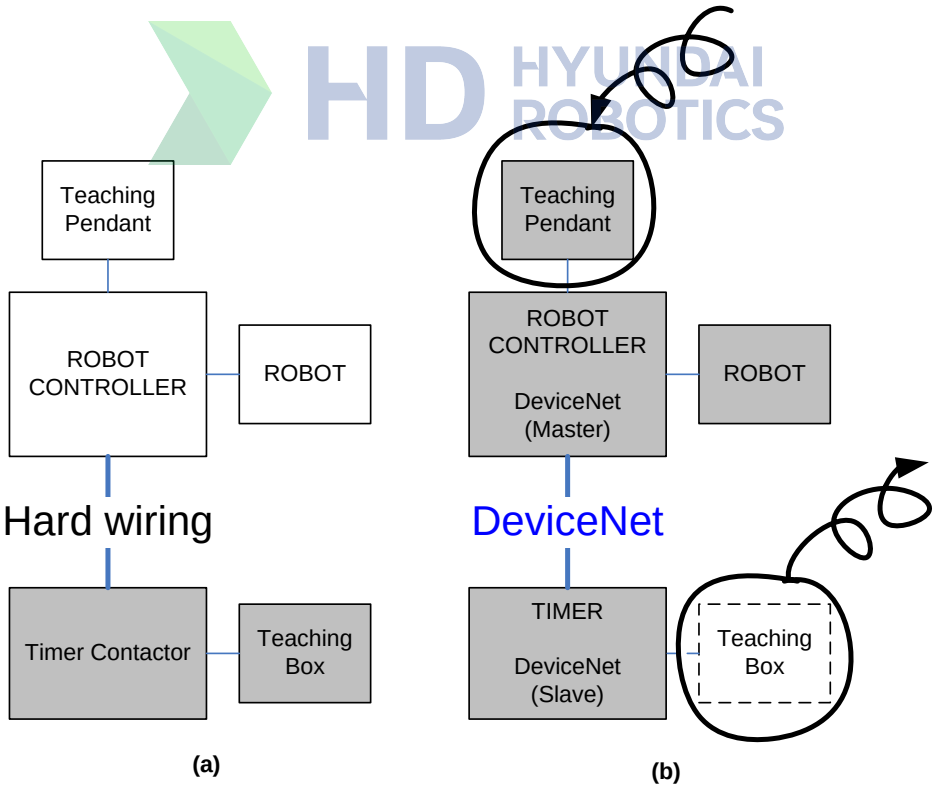


Figure 1.1 (a) Spot welding system separated / (b) Spot welding system integrated

The robot controller and welder communicate through DeviceNet. The robot controller is configured as the master and the welding controller as the slave.

1.2. Advantages and characteristics

1.2.1. Advantages

- Reduces the start-up time with its easy connection with other peripheral devices
- Saves on wiring costs due with use of DeviceNet (Lowers capital costs)
- Reduces downtime
- Allows control of the robot and welder from one control unit (robot teach pendant; provides a single point of control over the robotic resistance welding process)

1.2.2. Characteristics

- Secures reliable communication between the robot controller and the welder through the DeviceNet message method
- Makes it possible to access and use up to four welder timers (regardless of servo guns and pneumatic guns)
- Even when the timer model is changed, there is no need to change the robot controller software
- Enables the robot controller to handle individual files such as welding schedule, common welding data, and stepper data
- Makes it possible to share the history of errors and abnormalities and analyze errors as the controller manages the welding results data
- Monitors welding results in real time through the robot teach pendant, helping supplement the welding quality by changing the schedule program and stepper program

.

Table 1-1 File type and description

File type	File name	Description
Timer property information	ROBOT.NS#	Stores the timer information
Welding program data	ROBOT.ND#	Stores various program data

(# means the timer number)

1.3. System configuration

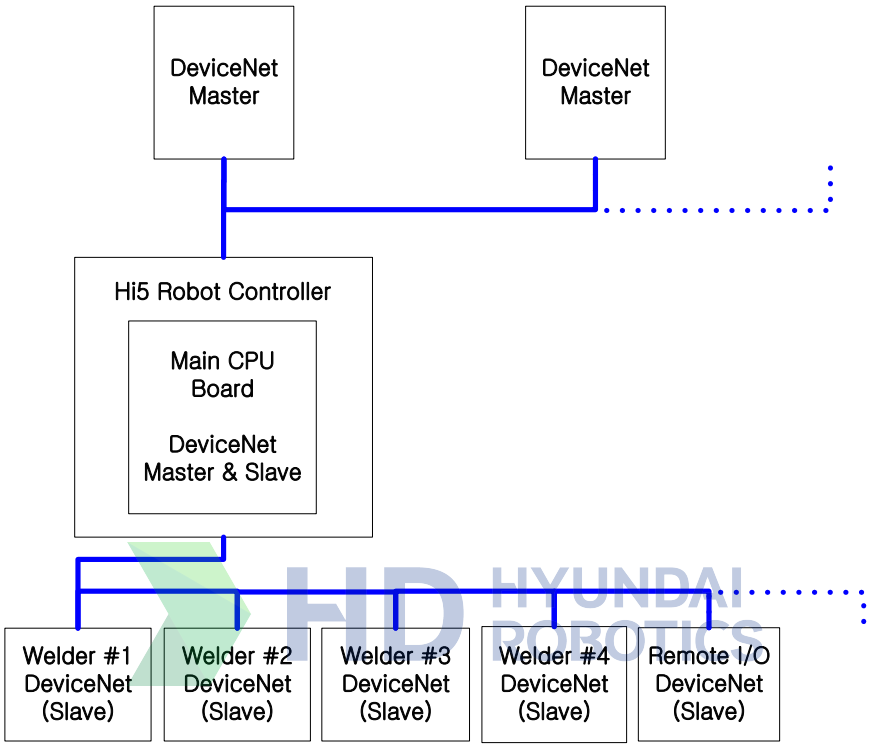


Figure 1.2 Example of an integrated welding system based on the Hi5a controller

1.4. Operation sequence

1) In "『[F2]: System setting』 / 『2: Input and output signal』 / 『12: Built-in DeviceNet master information and setting』", set whether to use and the communication speed to complete node search.

⇩

2) In "『[F2]: System setting』 / 『4: Application parameter』 / 『1: Spot welding』 / 『1: Setting of the tool number and gun type corresponding to the gun number』 / 『[F1]: Welder 1/F』", set the welder interface, communication method, and the node number for each welder number to complete.

⇩

3) In "『[F2]: System setting』 / 『4: Application parameter』 / 『1: Spot welding』 / 『8: Chowel welder interface』," enter the menu.

⇩

4) When the user enters the menu, the welder property information will be loaded automatically.

⇩

5) If the welder property information fails to be loaded, it should be loaded manually.

⇩

6) Edit and upload the programs, both common and specific, for individual welders in the setting screen of the teach pendant.

⇩

7) Set the spot welding parameter, input and output signal numbers, and input and output signals in the robot controller according to the welder specification.

⇩

8) Write the PLC program according to the welder specification.

⇩

9) Write the robot program, and check its operation before performing normal operation.

1.5. Menu tree

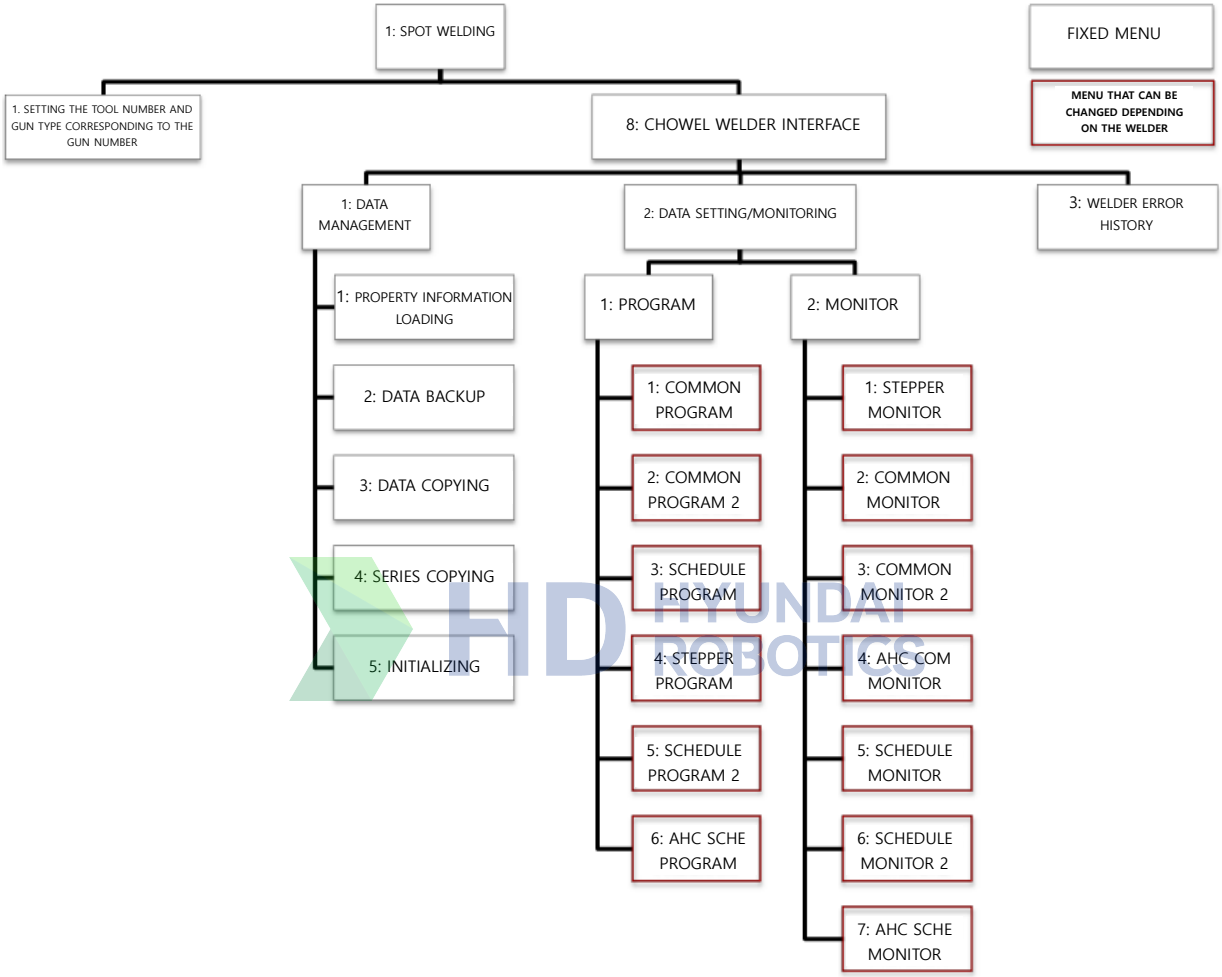


Figure 1.3 Menu tree of the spot welder interface

2 Welder interface

2.1. Data management

2.1.1. Property information importing

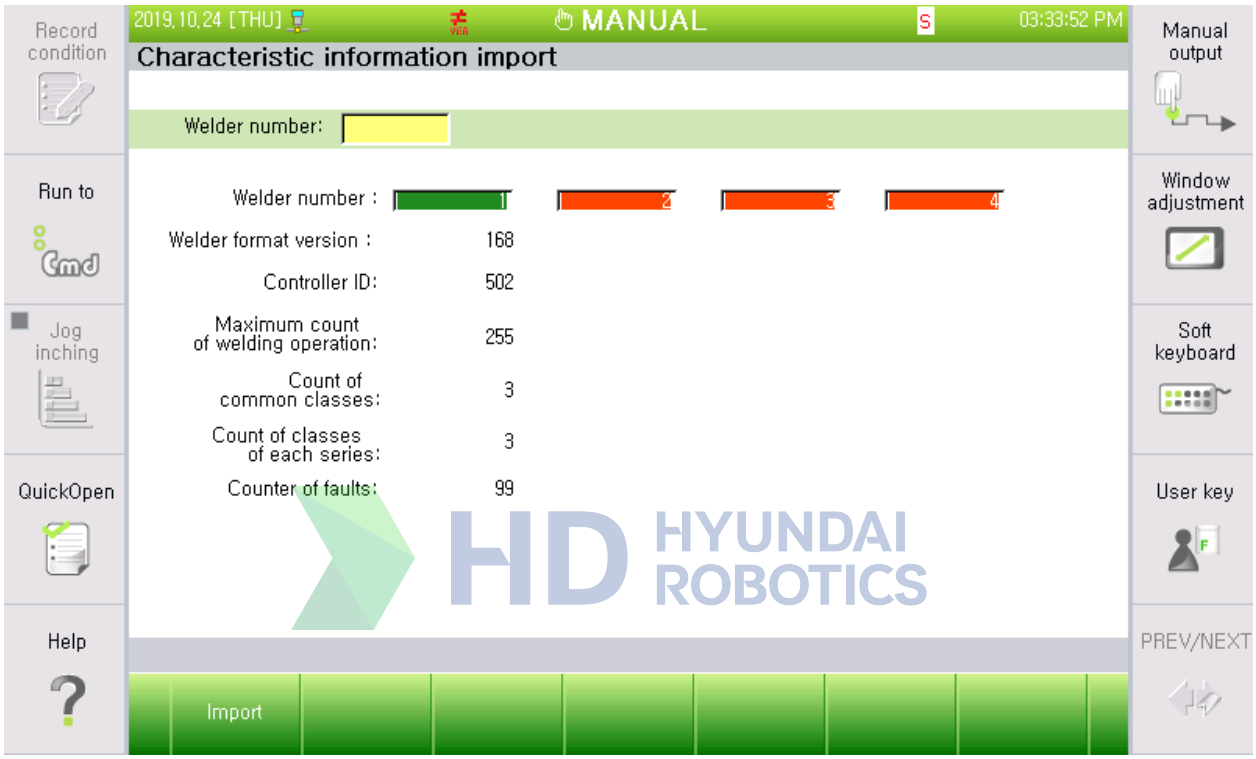


Figure 2.1 Property information importing

The property information is the data that must be prepared in advance to use the functions of the welder interface. It contains the structure of welder setting data, configuration of menus, etc. The property information is required by all functions of the welder interface.

The following shows the function of each part on the screen shown in Figure 2.1.

① For inputting the number of the welder from which the property information is to be imported.
② Shows the on/off-line status of the welder. Green color means online, and red color means off-line.
③ Shows the properties related to the current welder by using the stored property information.
④ If downloading was performed before, the property information would be shown even when the welder is off-line.
⑤ Imports the property information inputted in ① to the controller. If importing is completed normally, a message window saying "**Property information was stored**" will appear.

2.1.2. Data backup

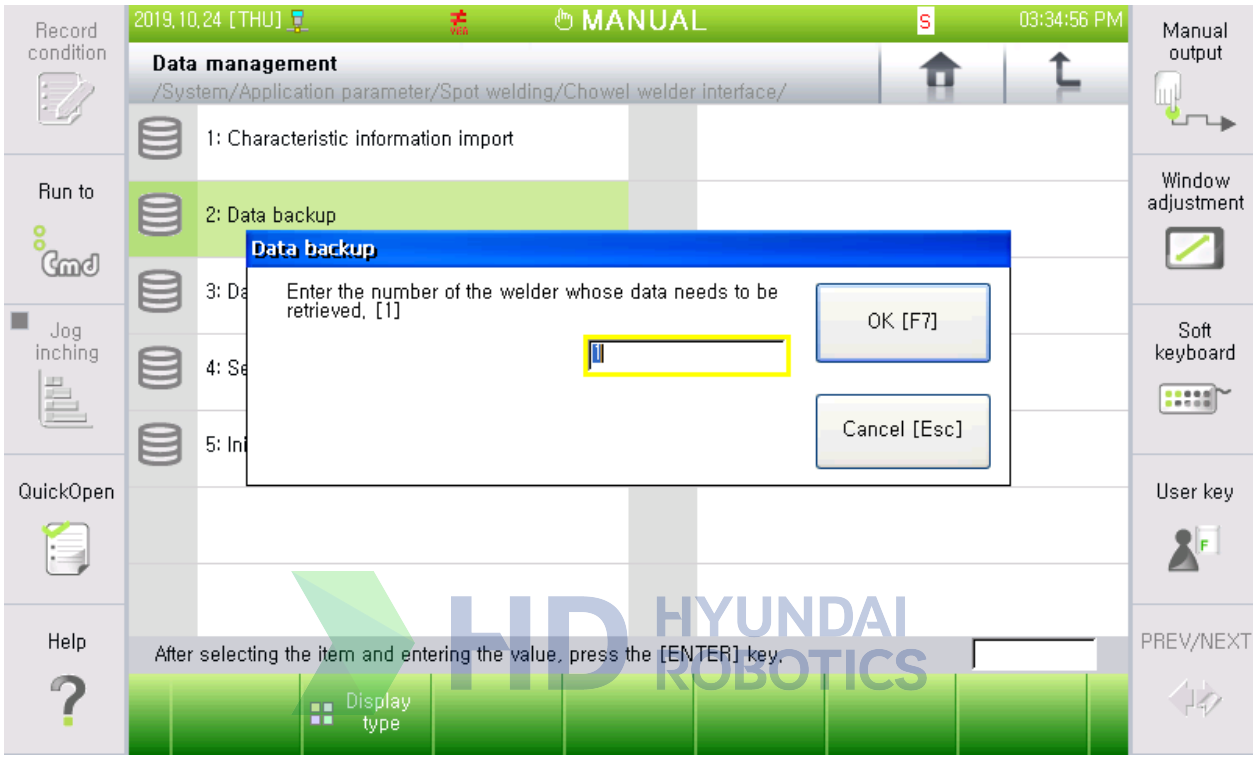


Figure 2.2 Data backup

Data backup is a function to back up the welder's setting data into the Hi5a controller (Figure 2.2). Input the number of the welder from which you want to import data, and press the OK button (or the F7 key) to start the backup process. It will take about 3– 4 minutes. When the data backup is completed, a message window saying "Data was backed up normally" will appear.

The backup data can be used in the following cases:

① When backing up the setting values of the welder
② To change the data of another welder connected to the Hi5a controller
③ To change the data of a welder connected to another Hi5a controller collectively

2.1.3. Data copying

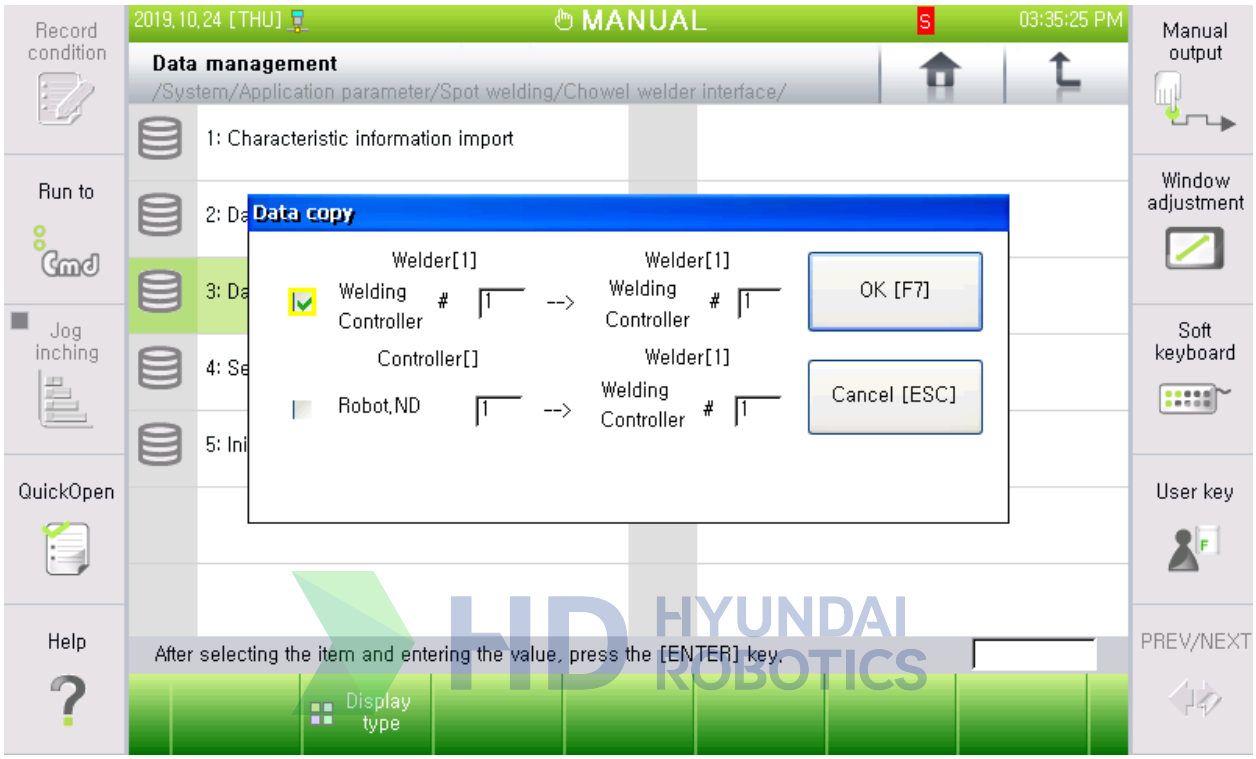


Figure 2.3 Data copying

Data copying is a function to copy data between welders and to copy backup data to a welder (Figure 2.3). Data copying between welders can be performed for the online welders of the same version. Copying the controller's backup data copy can be performed by using Robot.ND # file and Robot.NS# file as one set.
Data that can be copied through the data copy function is PROGRAM data, not MONITOR data.

2.1.4. Series copying

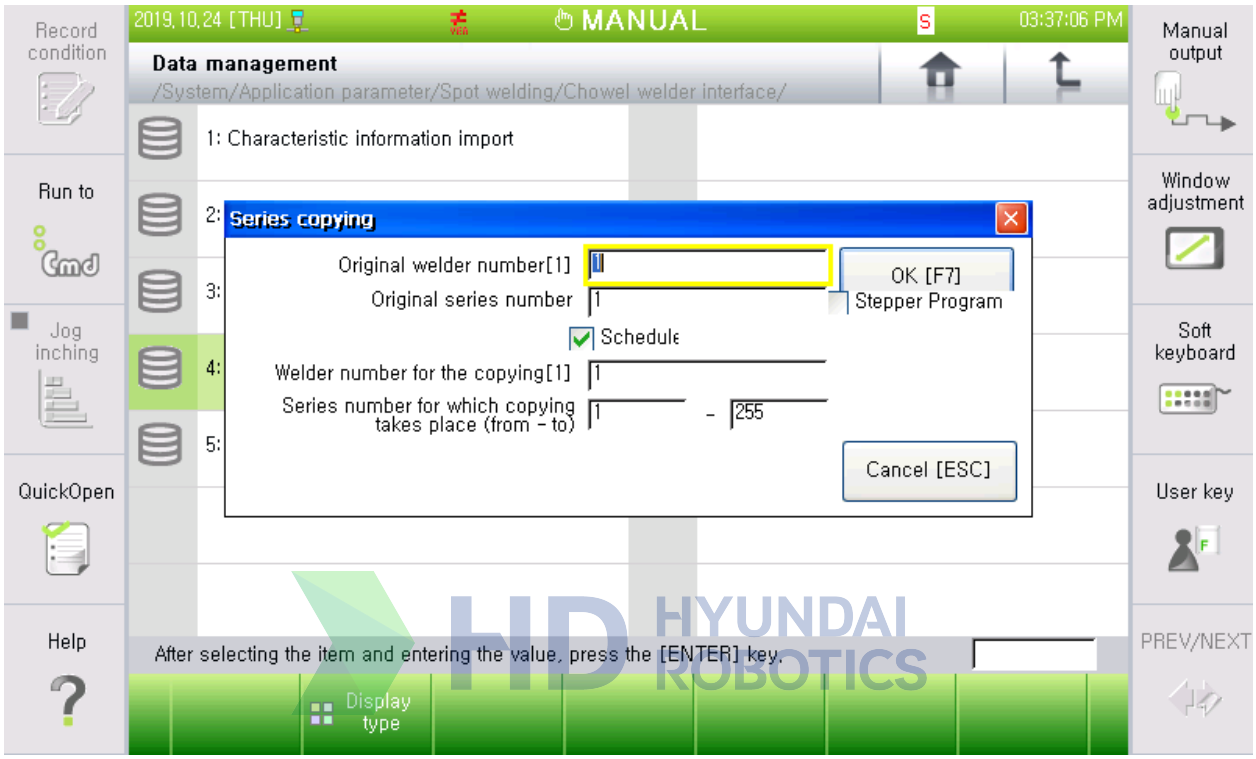


Figure 2.4 Series copying

Series copying is a function to copy only the data that has a series (Figure 2.4). You can select the schedule program or stepper program.

2.1.5. Initializing

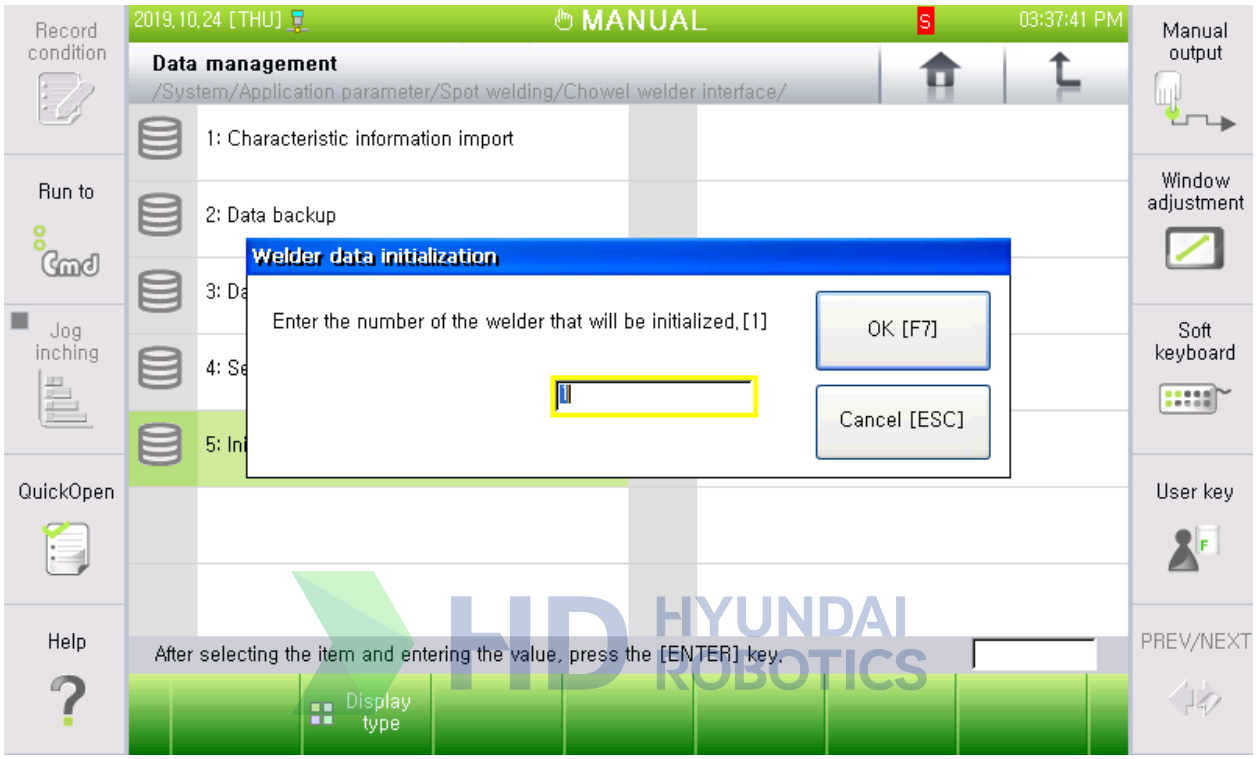


Figure 2.5 Initializing

The initializing menu is to initialize the status of the welder (Figure 2.5). When it comes to initializing, a dialogue box asking whether to initialize once again will appear when you press the OK button.

2.2. Data setting/monitoring

2.2.1. Program and monitor

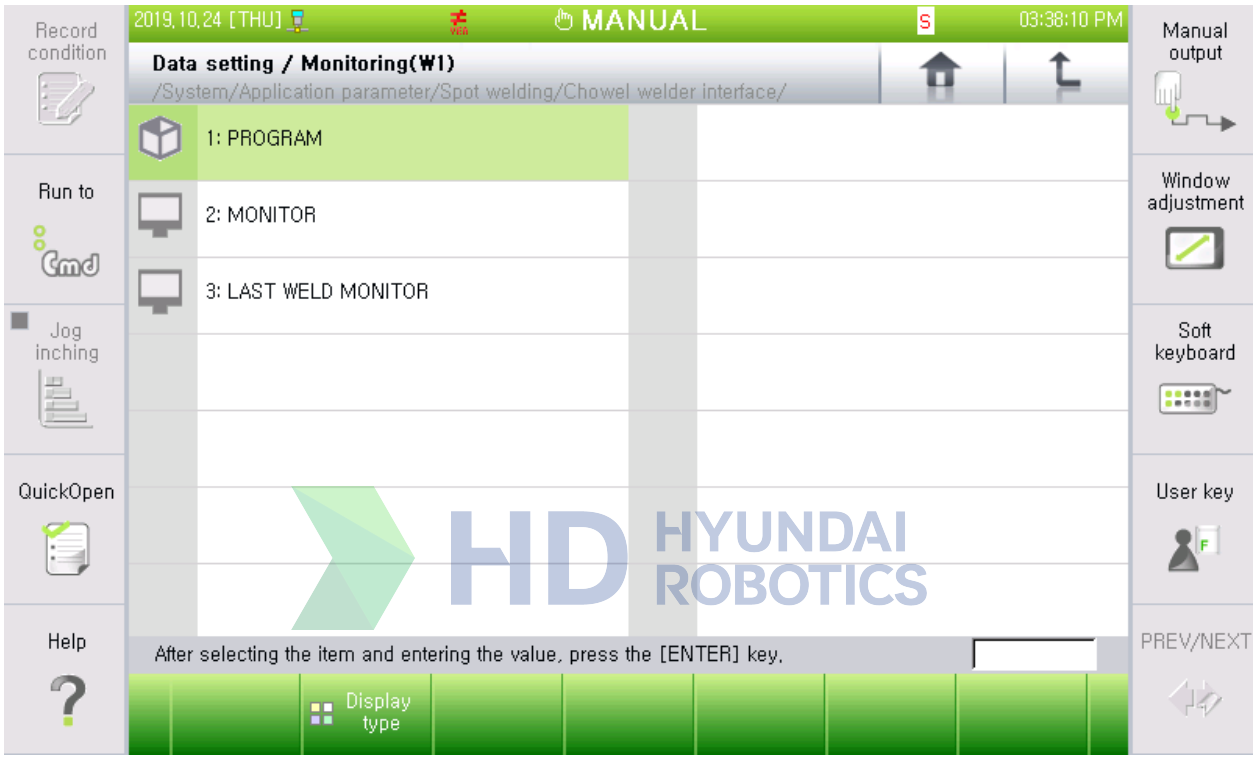
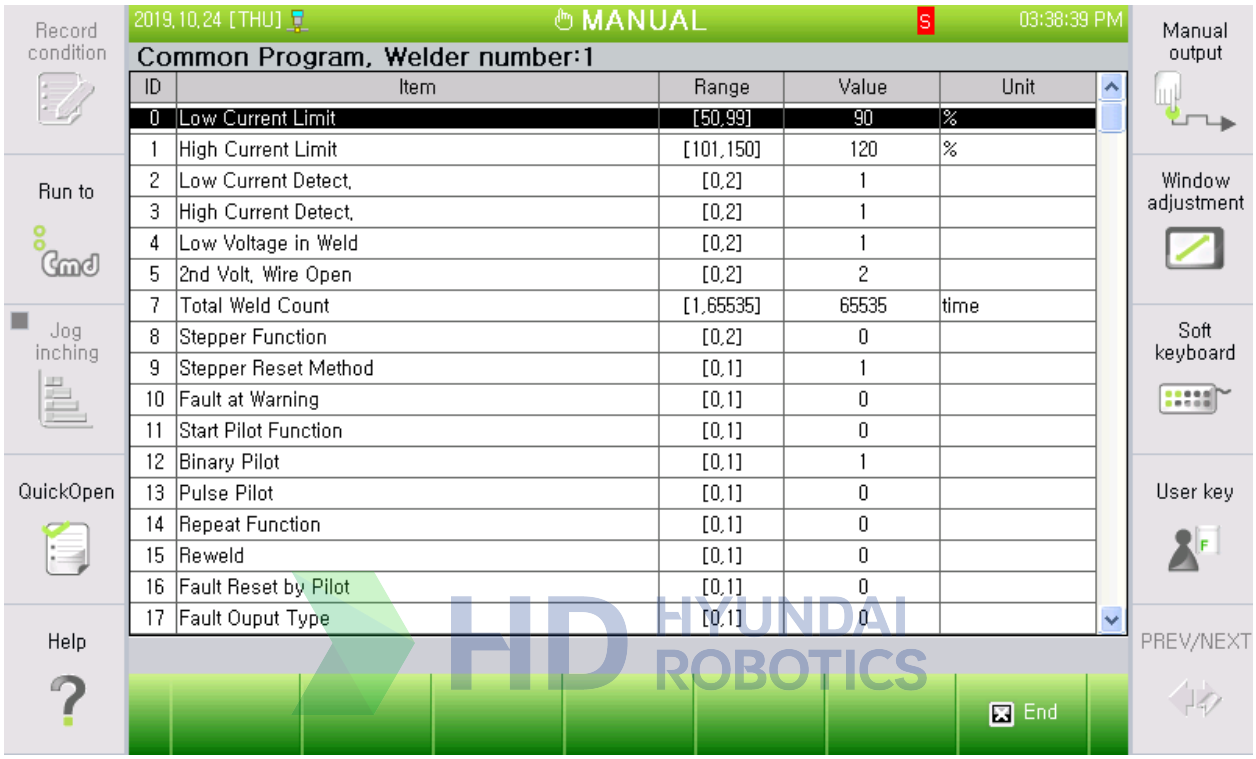


Figure 2.6 Data setting/monitoring window configuration

The welder data can be largely divided into the program data and the monitor data (Figure 2.6), and the contents of the menus will vary depending on the version of the welder.

2.2.2. Single series program



ID	Item	Range	Value	Unit
0	Low Current Limit	[50,99]	90	%
1	High Current Limit	[101,150]	120	%
2	Low Current Detect,	[0,2]	1	
3	High Current Detect,	[0,2]	1	
4	Low Voltage in Weld	[0,2]	1	
5	2nd Volt, Wire Open	[0,2]	2	
7	Total Weld Count	[1,65535]	65535	time
8	Stepper Function	[0,2]	0	
9	Stepper Reset Method	[0,1]	1	
10	Fault at Warning	[0,1]	0	
11	Start Pilot Function	[0,1]	0	
12	Binary Pilot	[0,1]	1	
13	Pulse Pilot	[0,1]	0	
14	Repeat Function	[0,1]	0	
15	Reweld	[0,1]	0	
16	Fault Reset by Pilot	[0,1]	0	
17	Fault Ouput Type	[0,1]	0	

Figure 2.7 Common program

The single series program means a program that shall be commonly applied to all welding conditions like a common program (Figure 2.7).

2.2.3. Multi series program

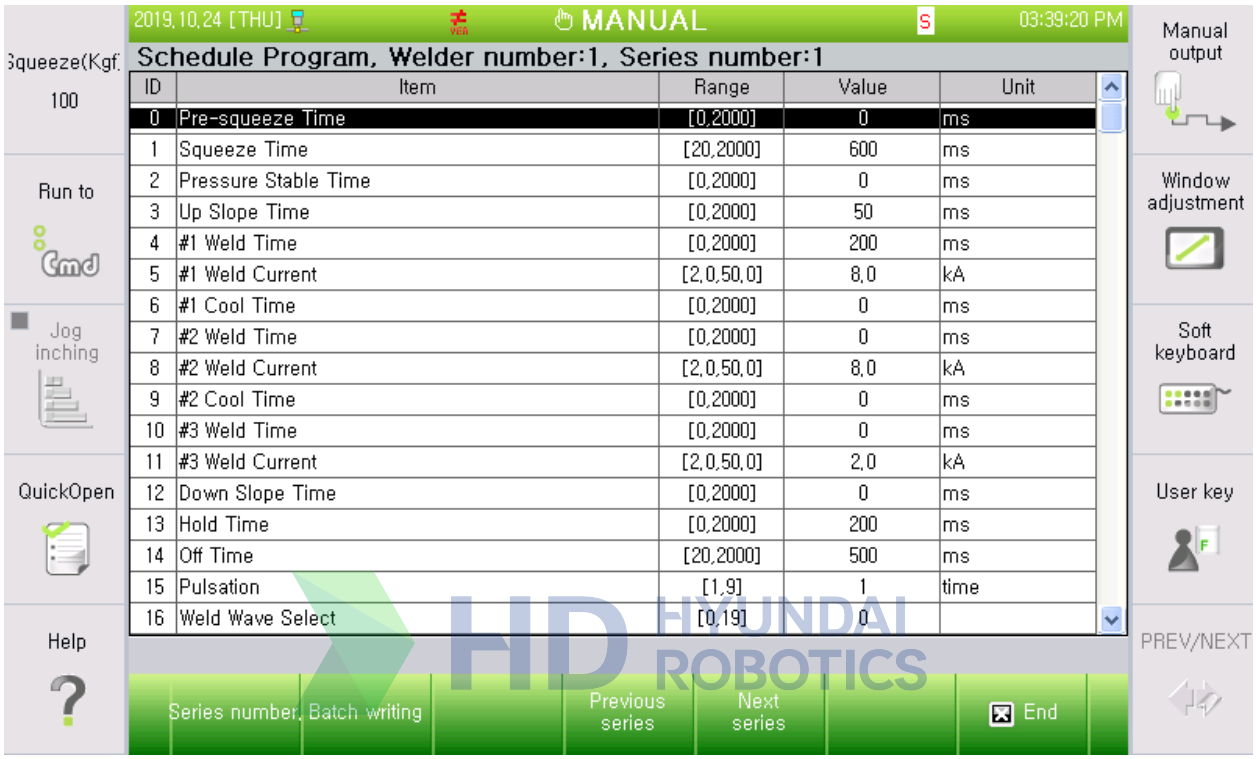


Figure 2.8 Schedule program

Multi-series programs are programs that enable you to select a series (Figure 2.8). Unlike a single series program, a multi-series program makes it possible to set various data by selecting a series. Keys are provided for this.

The following shows the individual parts shown in Figure 2.8.

① Shows the set squeeze force value of the currently set series
② Shows the number of the series currently set
③ A dialogue box to set a series will appear (Figure 2.9).
④ Allows you to move to the previous series. If the range of the current series is 1– 255 and the current series is 1, this key will allow you to move to the series 255, the highest series value.
⑤ Allows you to move to the next series immediately. If the range of the current series is 1– 255 and the current series is 255, this key will allow you to move to the series 1, the lowest series value.
⑥ A function to input specific data to the series of the desired range at once (Figure 2.10)

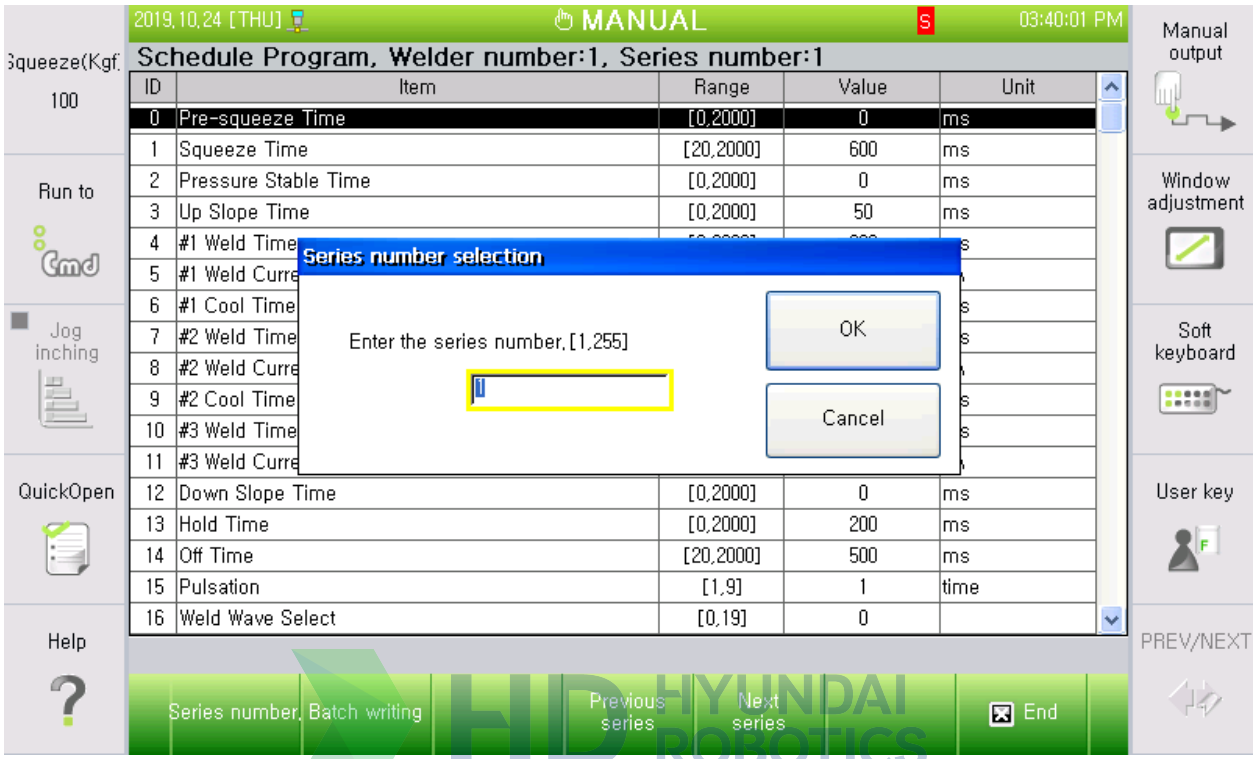


Figure 2.9 Series number dialogue box

2.2.4. Data batch writing

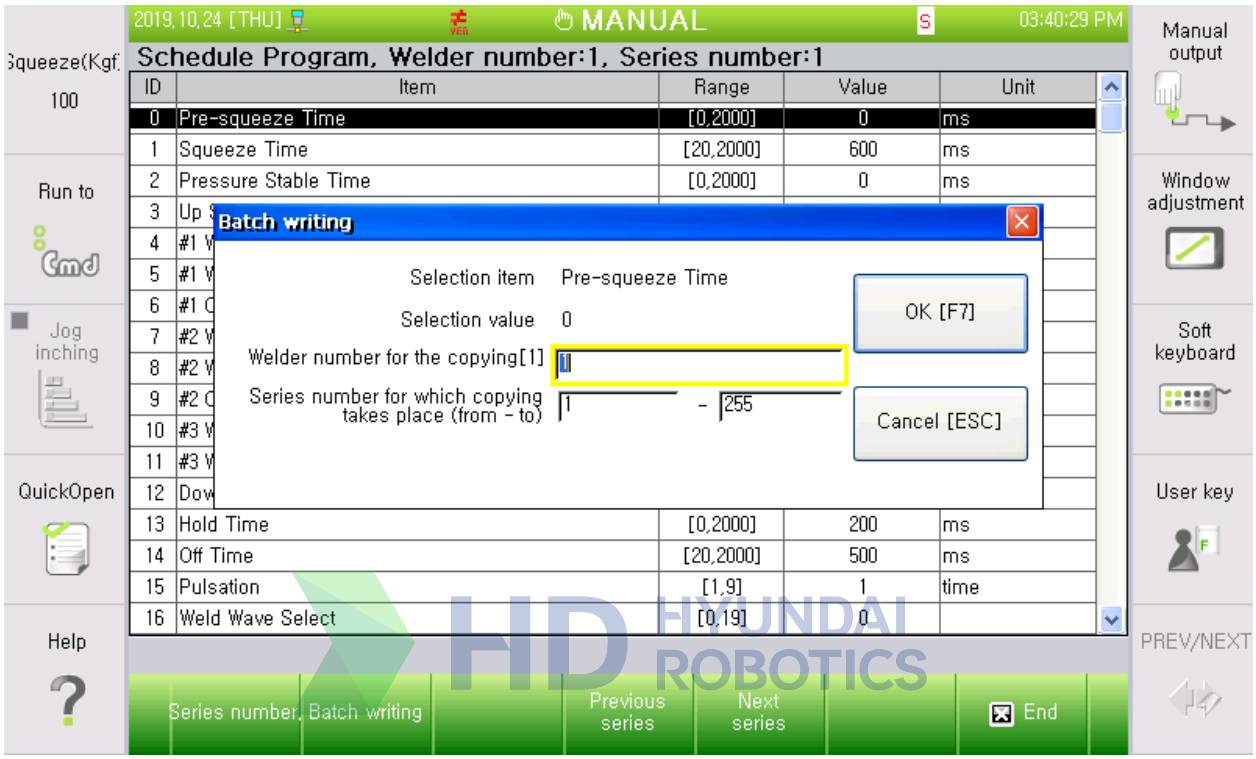


Figure 2.10 Data batch writing menu

Batch data writing is a function to copy a single unit of data to multiple series at once (Figure 2.10). Input the number of the welder you want to copy from and the series numbers, and press the OK button or F7 key.
For example, when you change the value of # 2 WELD CURR., which is the item ID 14 and want to copy it collectively to the 1-255 series of the welder #2, you can do as follows.

① Move the cursor to #2 WELD CURR which is the 14th item.
② Change the value by inputting the number 15, and press the ENTER key
③ Click Batch Data Writing, or press F2 to display the Batch Data Writing window.
④ Input 2 for the number of the welder to copy from.
⑤ Input 1 in the previous box and 255 in the subsequent box for the series number to copy to.
⑥ Press the OK button to perform the batch writing.

2.3. Welder error history

Welder error history is a function to check the abnormality of the welder, if an error occurs during welding, through the teach pendant of the Hi5a controller.

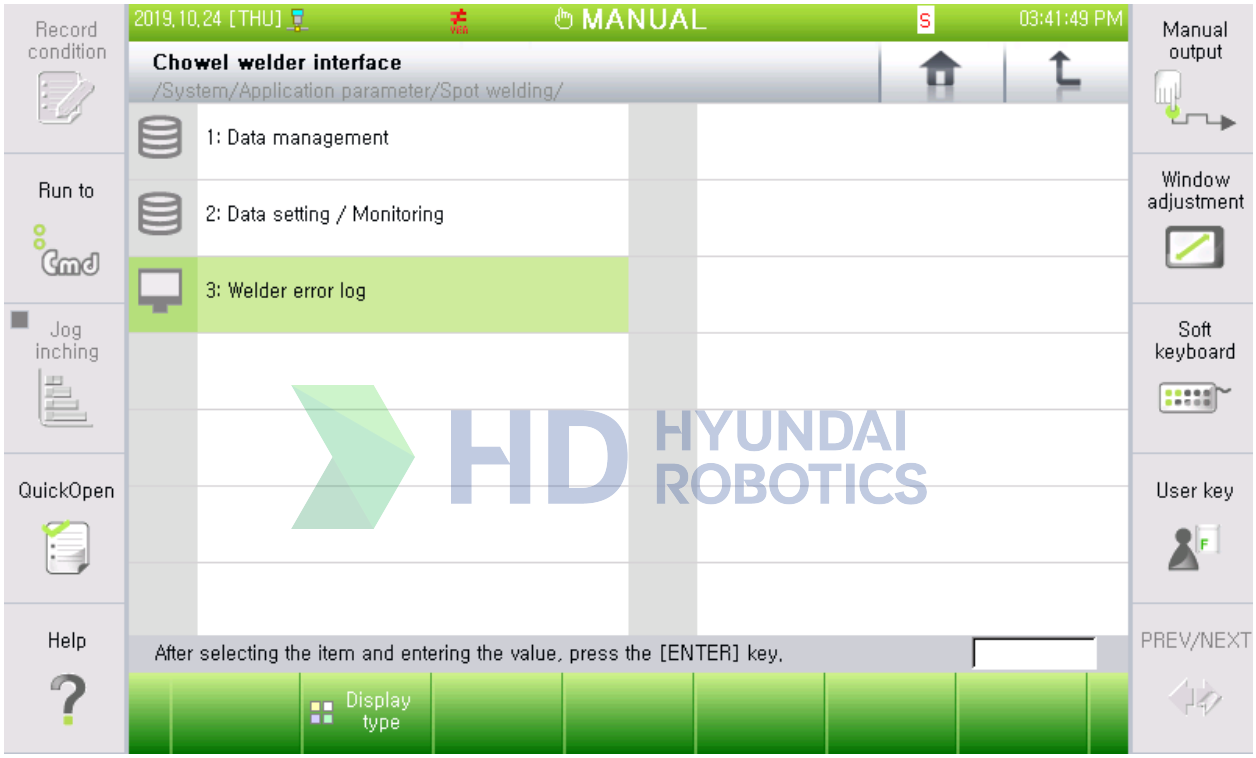


Figure 2.11 Welder error history menu

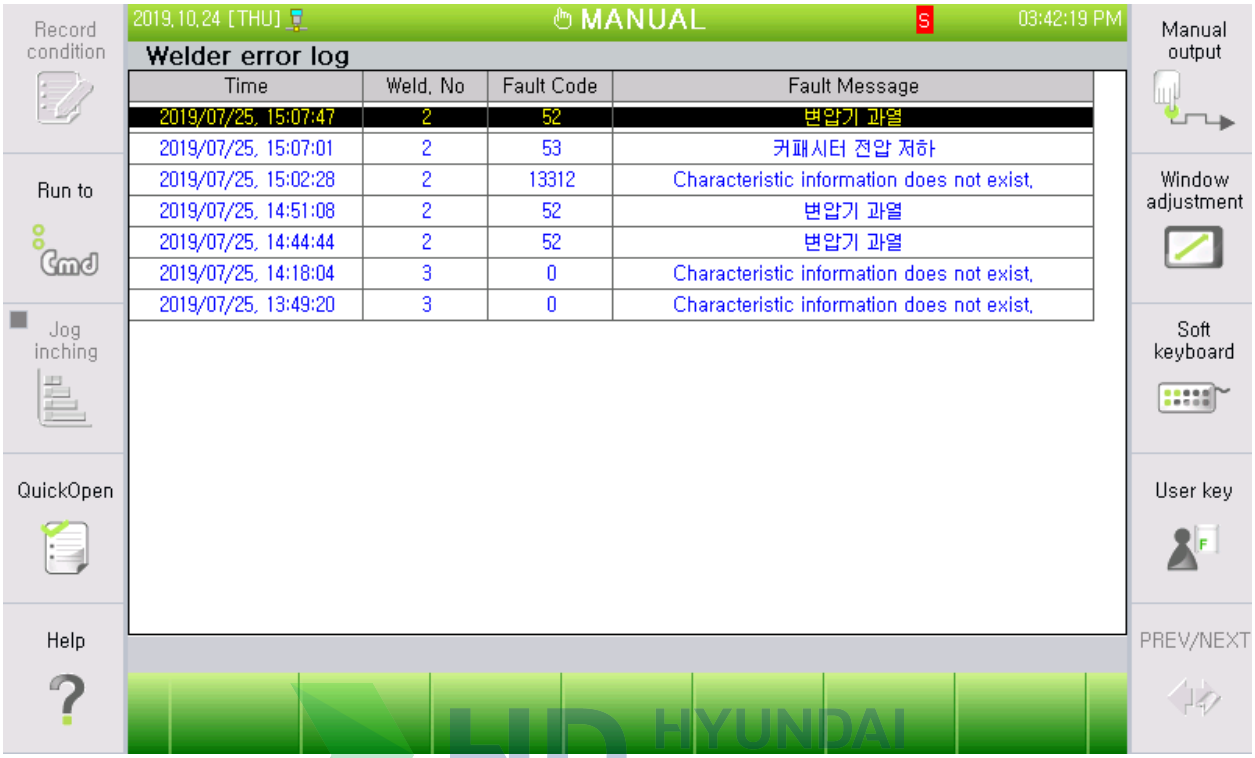


Figure 2.12 Welder error history

(Caution) While the welder is connected, an error-related status will be displayed even when there is no property information, but it is impossible to check what the error message is.
In this case, if the property information is imported through the property information import function, an error message will be normally retrieved.

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3 Abnormality and errors

Code	There is an error in the property information file.
Contents of abnormality	There is a problem with the stored property information file. Please update the property information through the menu of Data Management → Property Information Importing.

Code	The value has exceeded the allowable range. [Range]
Contents of abnormality	The input value is exceeding the limited range. Please input a value within the range.

Code	The number of the original welder is the same as the number of the welder to copy from.
Contents of abnormality	Will be shown when inputting the same welder number for the original welder and the welder to copy from during the process of data copying.

Code	Class information was not stored correctly.
Contents of abnormality	There is a problem with the class-related information in the property information. Please update the property information through the menu of Data Management → Property Information Importing.

Code	The error information was not stored correctly.
Contents of abnormality	There is a problem with the error-related information in the property information. Please update the property information through the menu of Data Management → Property Information Importing.

Code	Data transmission between the main board and teach pendant failed.
Contents of abnormality	Will be shown when an error occurs in the communication system while recording or importing welder data. Please check the connection between the controller and teach pendant.

Code	The welder is not connected.

Contents of abnormality	The welder of that number is not connected normally through Device Net. Please check the connection.

Code	Copying has failed.
Contents of abnormality	Data copying between welders has not completed normally. Please check the network connection of the welders or try copying again.

Code	There is an error with the welder data file.
Contents of abnormality	There is a problem loading the welder data file. It is required to check whether there is a file and to check the data.

Code	The property information data is not stored normally
Contents of abnormality	An error occurred while storing the property information file. Please check whether you have enough storage in the teach pendant and then try again.

Code	Data storing failed.
Contents of abnormality	An error occurred while storing the data. Please check whether you have enough storage in the teach pendant and then try again.

Code	The version does not match between the welders.
Contents of abnormality	The version does not match between the welders, which to copy from and copy to, making it impossible to perform copying. Please check whether the file changed or the version of the welder changed.

Code	The waiting time has been exceeded.
Contents of abnormality	Will occur when the communication between the main board and the teach pendant does not work well, or it takes a long time for the controller to process. Please try again.

Code	The data has an error.
Contents of abnormality	The data of the backup data file has exceeded the normal range.

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