HYUNDAI ROBOTICS

WARNING

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

Hi5aHO230628FMEN2

Hi5a Controller Function Manual

HRVision-OCR

HD HYUNDAI ROBOTICS

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Printed in Korea – Jun. 2023. 2nd Edition

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1 Overview

1. Overview

1.1. About HRVision-OCR

HRVision-OCR is a PC vision software for character recognition.

HRVision-OCR provides color graphic control buttons and an intuitive user interface for user convenience, as well as a quick and precise implementation of auto parameter setting, font registration, lighting control, and communication with an external device for character recognition.

Additionally, Hyundai robot control data communication and Siemens Programmable Logic Controller (PLC) communication protocols are embedded for any user to easily interconnect and use the vision with robot and process systems.

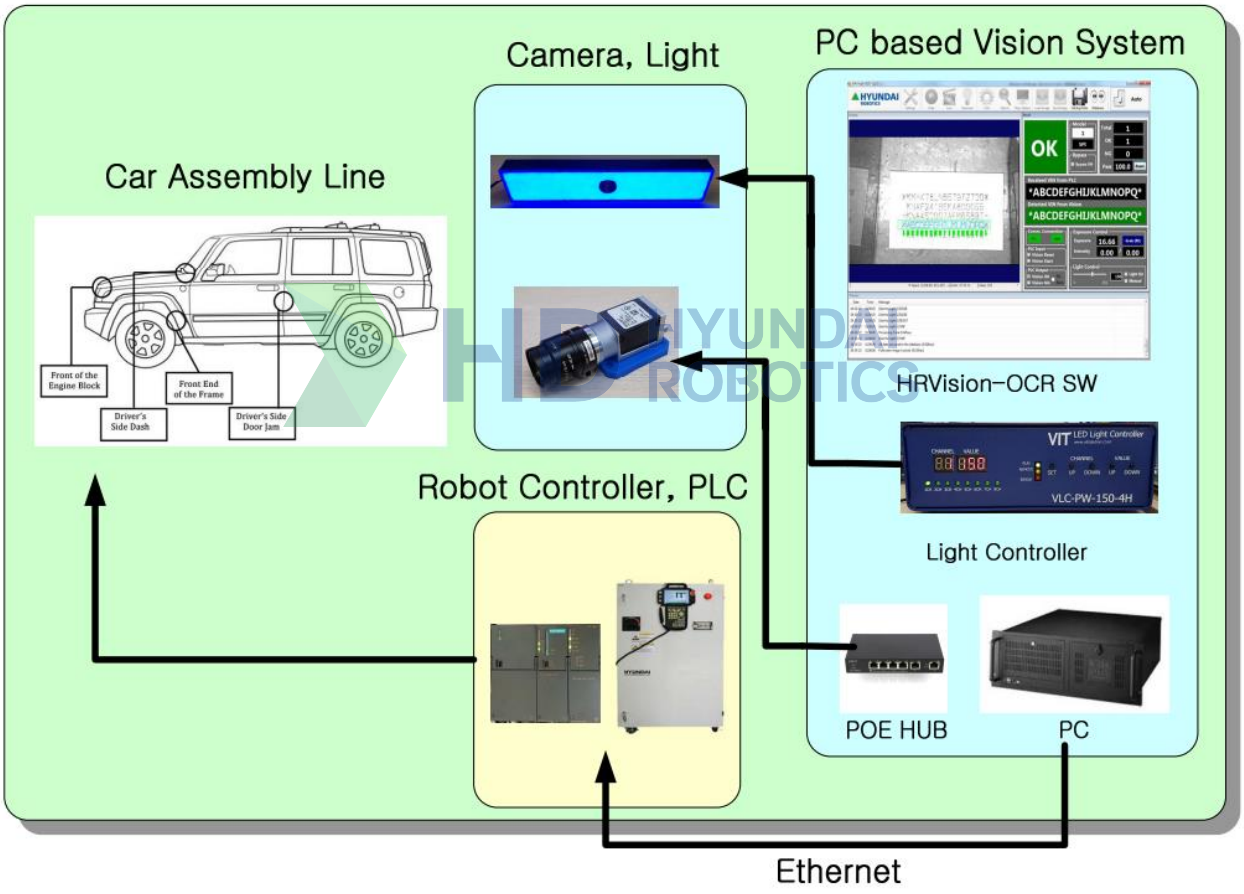
HRVision-OCR provides the following convenient functions:

Simple Control	The vision system can be easily configured and is operated with buttons.
Auto Parameter Setting	Character recognition variables can be easily configured with image registration.
Font Registration	Anyone can easily register fonts for character recognition through font registration with model-specific auto segment and individual characters.
Lighting Control	Lighting brightness can be controlled according to model and environment.
Character Recognition	Character recognition is facilitated with model-specific font registration.
Exposure Calibration	Exposure for font registration, user-defined exposure, and auto exposure calibration help good character recognition, regardless of ambient illumination changes.
Tools	Function-specific tools can be used to configure camera calibration, pattern registration, area setting checking, communication setting, and data management. In addition, it is embedded in the data communication protocol for Hyundai robot controllers, enabling easy interface with Hyundai robots and communication with process PLCs.
Monitoring	Process sequence, communication sequence with Hyundai robot and process PLCs, and the monitoring of exam results are supported by error and data history management. The image can be saved at the moment of examination.

1.2. System

The figure below is a brief diagram of the imprint-checking vision system with HRVision-OCR. The imprint-checking vision system consists of HRVision-OCR software and hardware: the PC, POE hub, GigE type digital camera, LED lighting, and lighting controller.

A user can configure the character recognition vision system and perform an auto operation with the HRVision-OCR program while receiving the current imprinting string and sending the vision result through Ethernet communication to the Siemens PLC or Hyundai robot controller.



1.2.1. Hardware

HRVision-OCR has the following recommended H/W specifications:
HRVision-OCR is an application for 64-bit Microsoft Windows OS. Please check the version of Windows on the PC you are using.

H/W	Item	Recommended Specifications
PC	CPU	At least a 2-GHz multicore processor and an L2 cache of 512 KB or more
	OS	Microsoft Windows 7 64-bit
	RAM	2 GB or more
	Video	Peripheral Component Interconnect Express (PCIe) ×16 Video Card
	HDD	80 GB or more
	CD-ROM	48x
Lighting	Light	Blue LED, Light Controller: RS232 Serial Communication
Vision system	POE Hub	NETGEAR GS305P
	Camera	Basler acA1920-40gm (1920 X 1200 Resolution) 1EA
	Lens	Kowa C-Mount lens: LM25JCM(2/3" 25 mm/F1.4)
	Camera Cable	20 m Ethernet Cable (RJ45)
	Ethernet Port	Gigabit Ethernet Adapter 2EA - Digital Camera 1EA - Siemens PLC (or Robot Controller) 1 EA

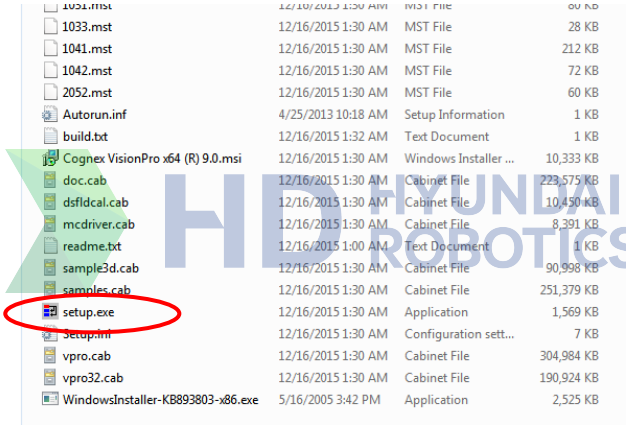
To use the HRVision-OCR with several models registered, use a PC with a high-performance CPU and enough memory.

1.2.2. Software

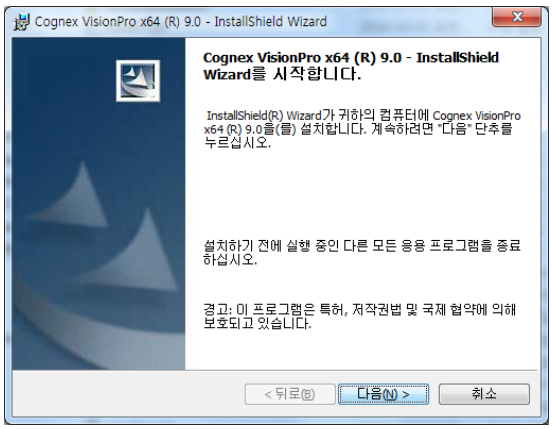
The software consists of VisionPro 9.0 and the HRVision-OCR Setup Software (SW).
VisionPro 9.0 is a software that provides the driver with Cognex Frame Grabber and different applications.
HRVision-OCR Setup SW is a PC vision software for Hyundai robots to recognize characters and can be used after program installation and license registration.

1.2.2.1. Install VisionPro

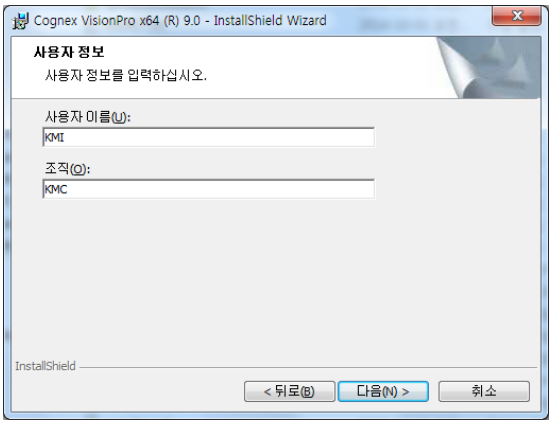
Exit all applications on the system.
Access the 64-bit VisionPro 9.0 installation folder and run“setup.exe”.



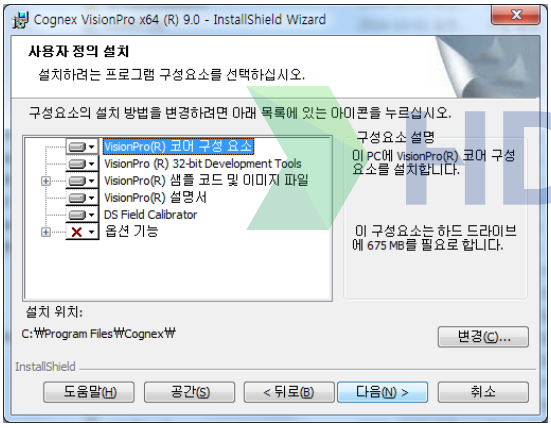
With the installation screen as follows, proceed with the installation procedure according to the instructions:

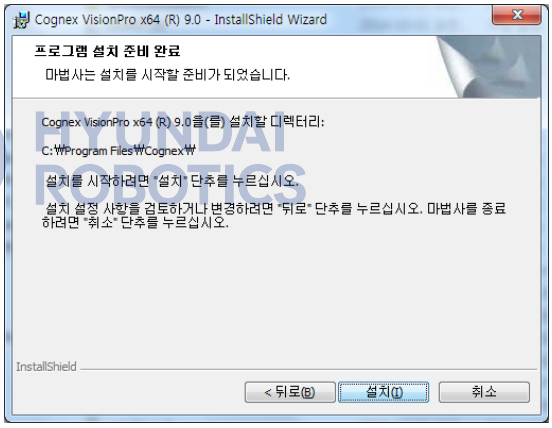


Please agree with the following license use and enter your user information:

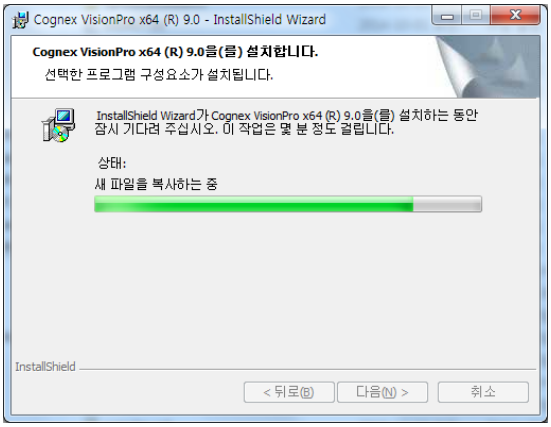


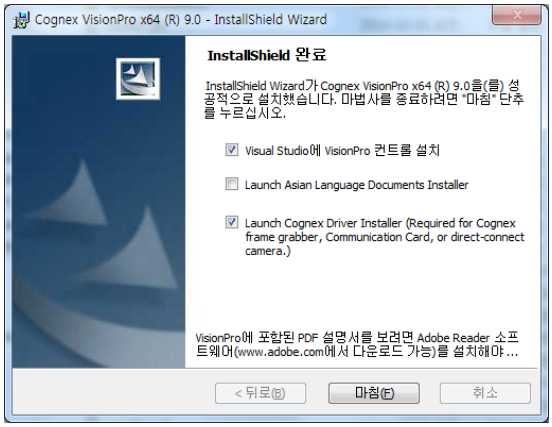
Follow the instructions to install Cognex VisionPro (R) 9.0:

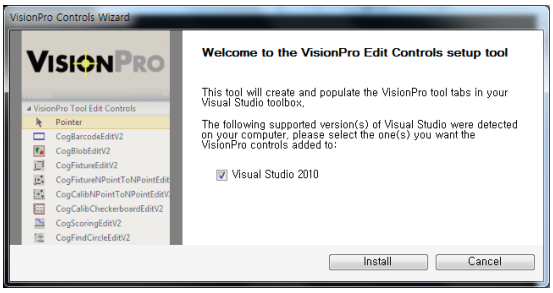


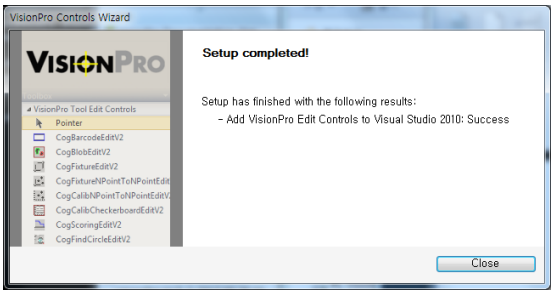


Once Cognex VisionPro (R) 9.0 is installed, install Visual Studio VisionPro control and Cognex x64 driver.

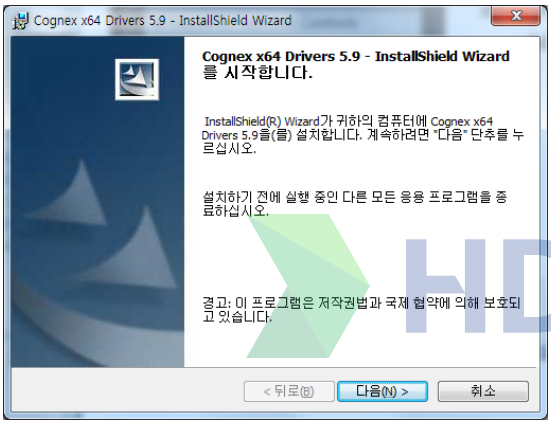


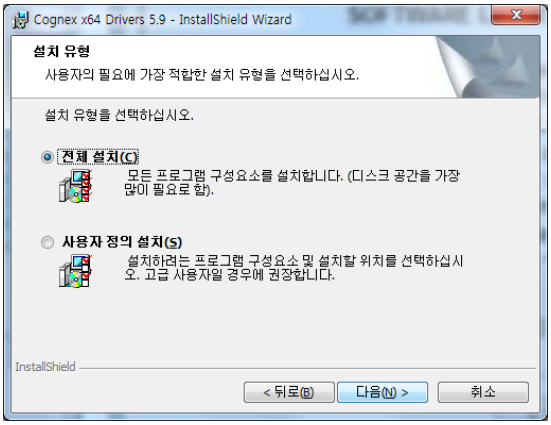


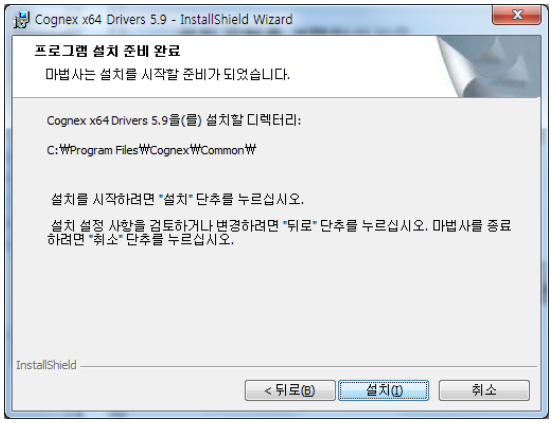




Agree with the following user rights for installing Cognex Driver, and then select the installation type before proceeding with the installation:

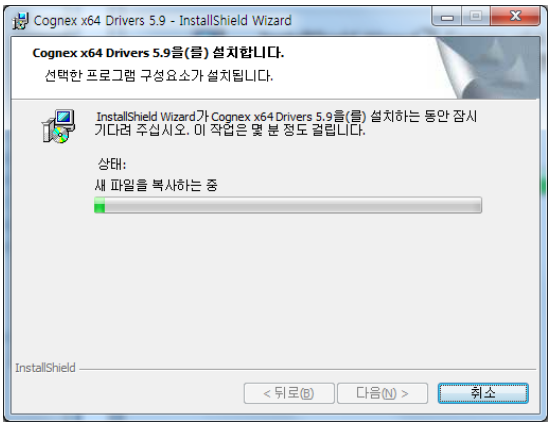


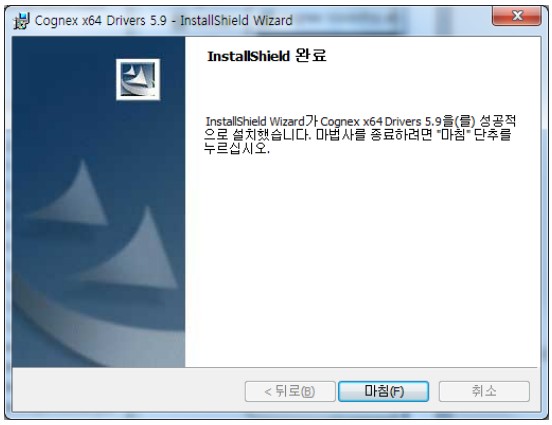


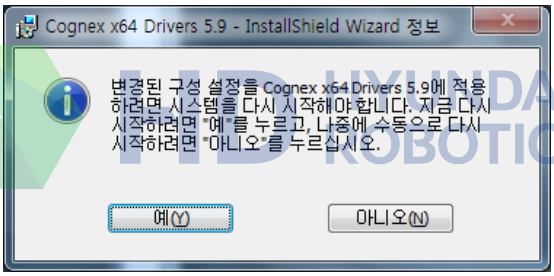


Follow the instructions to install the software for Cognex Frame Grabber and camera.

Reboot the system when the driver is installed.







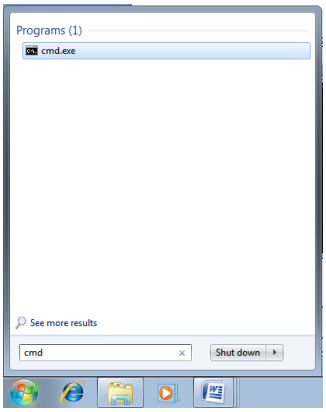
The HRVision-OCR program cannot run without VisionPro 9.0 installed.

Check if it is installed in“C:/Program Files/Cognex/VisionPro”.

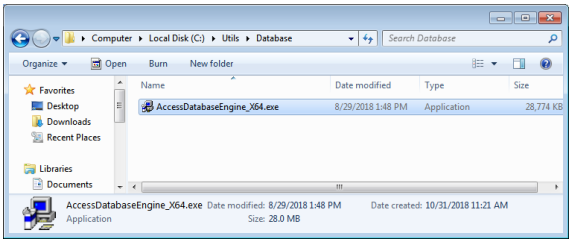
1.2.2.2. Install HRVision-OCR

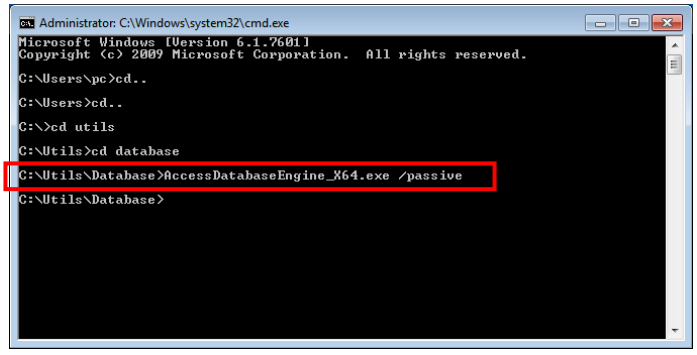
HRVision-OCR program can be installed through the following procedure:

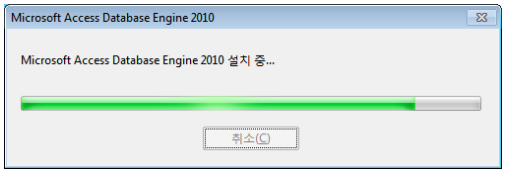
Install the Microsoft AccessDatabase patch program for the database (mdb) interface.
Enter and run “cmd” in [Search Programs and files] of the Windows Start Menu, as follows:



Run the database patch program by entering and running “AccessDatabaseEngine_X64.exe/passive”in the Command Prompt (cmd) window.
Here is the sample of a running AccessDatabaseEngine_X64.exe program in“C:/Utils/Database”, with the cmd window.

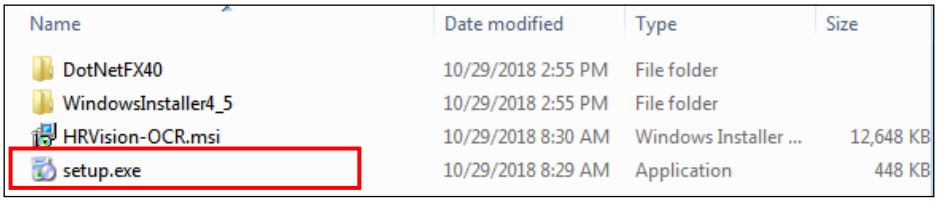




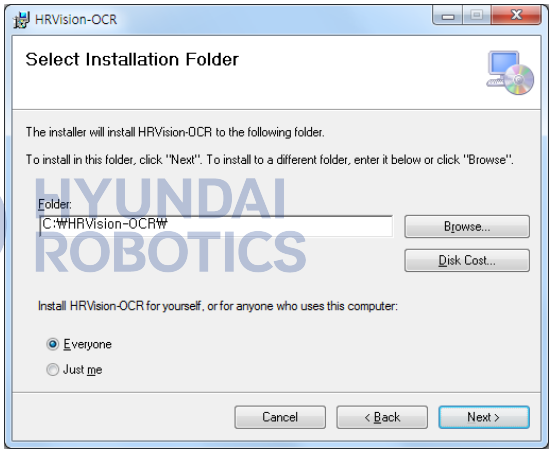


Once the AccessDatabase engine is installed, install the HRVision-OCR program.

Run “setup.exe” in the HRVision-OCR installation file folder.

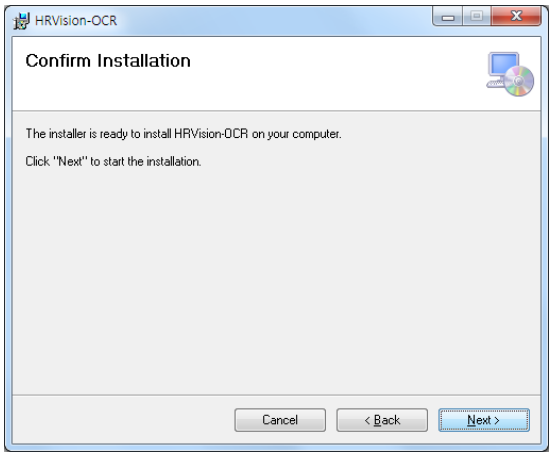


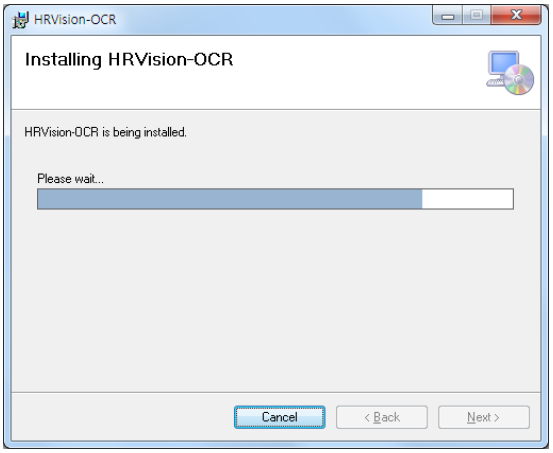
With the installation screen as follows, proceed with the installation procedure according to the instructions:

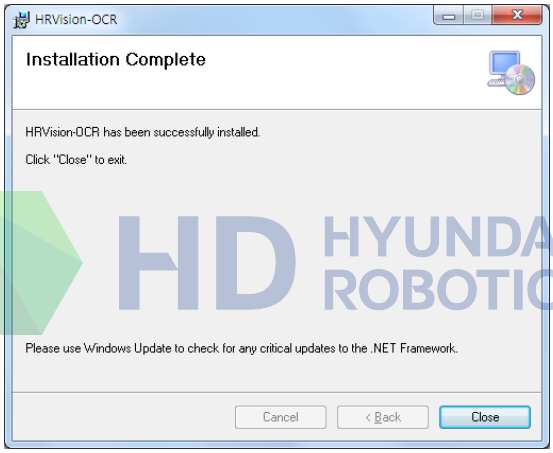


Executable files of HRVision-OCR are copied into“C:/HRVision-OCR”. The user is not allowed to change the folder.

Click the [Next] button to install the “HRVision-OCR” program.







1.3. Run HRVision-OCR

Double-click the HRVision-OCR icon in the desktop to run the HRVision-OCR program.

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2 Enter License

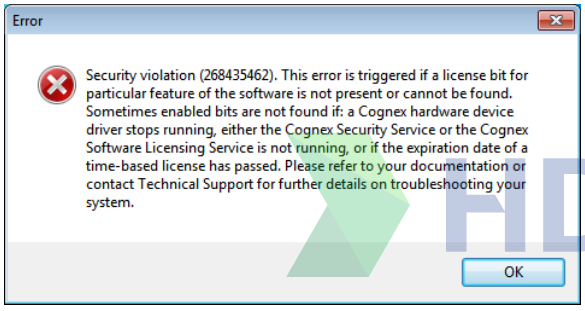
2. Enter License

Enter a license key to use HRVision-OCR.
Without an entered license key, no operation is available.

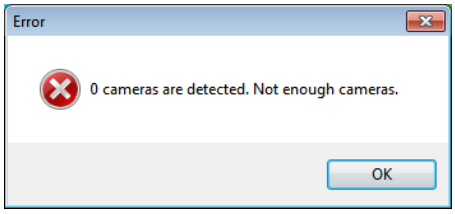
2.1. HRVision-OCR License

To use HRVision-OCR, enter a license key corresponding to the Cognex equipment of PC where the SW is installed.
Provide the “Serial No.” of the Cognex dongle key to the supplier when purchasing the HRVision-OCR license.
A corresponding key code will be provided to you.

Upon installation of the HRVision-OCR, run it as explained in 1.3.
If no Cognex device or dongle key is installed, the program will exit with the following warning window:

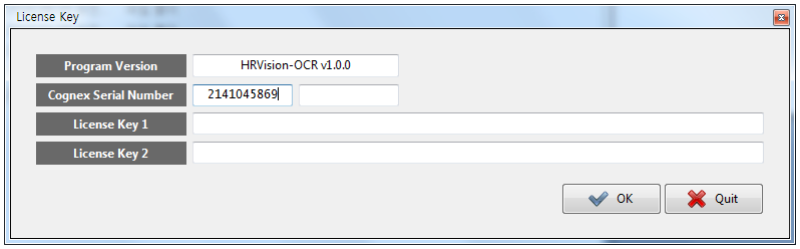


If a digital camera is not connected or does not function, the program will run with the following warning window, and the image grab function will not be available.

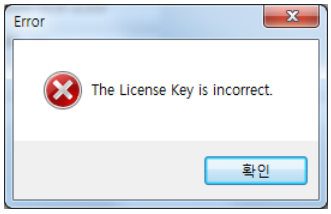


Make sure that the dongle key and digital camera are installed.

If the dongle key is installed, the following input window will appear.
Enter the license key from the supplier and then click the [OK] button.



If the entered key is incorrect, or if the Cognex equipment on the PC is different from the Frame Grabber or dongle key information from the supplier, the following warning window will appear.



The license key will be stored in“C:/HRVision-OCR/Data/LicenseKey.txt”. It only needs to be entered once.

If the HRVision-OCR program is uninstalled from the PC, or if the operating system is reinstalled or formatted, the entered key code will disappear. It needs to be reentered after reinstallation.
Therefore, store or back up the key code in a safe place.

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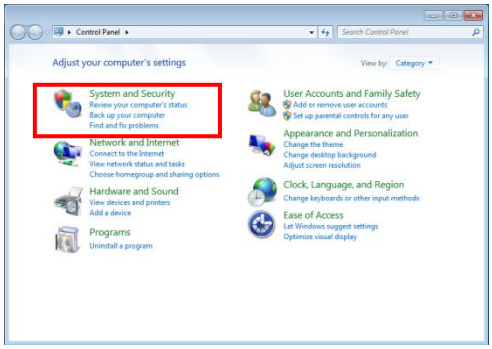
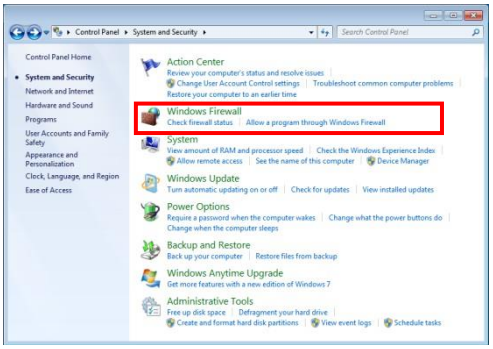
3 Camera Setup

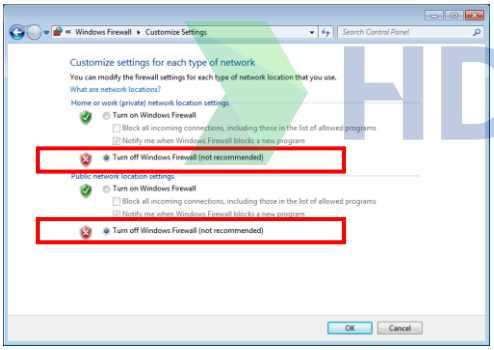
HRVision-OCR will not work if no camera is connected.
For smooth GigE Digital Camera access in HRVision-OCR, turn off the firewall, set the network adapter and camera IP, and then turn off the screen saver and sleep mode.

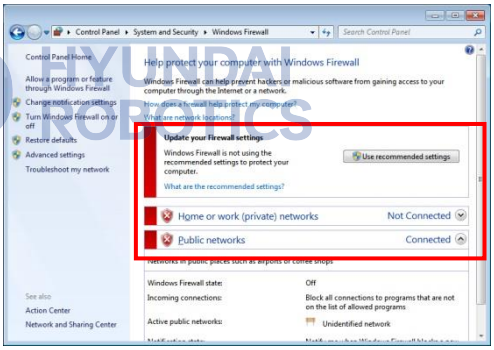
3.1. Turn Off Firewall

Click the Firewall item in Control Panel and turn it off, as follows:



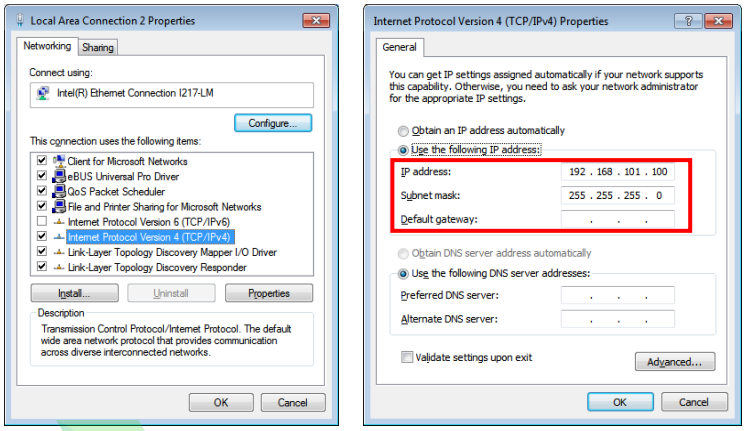




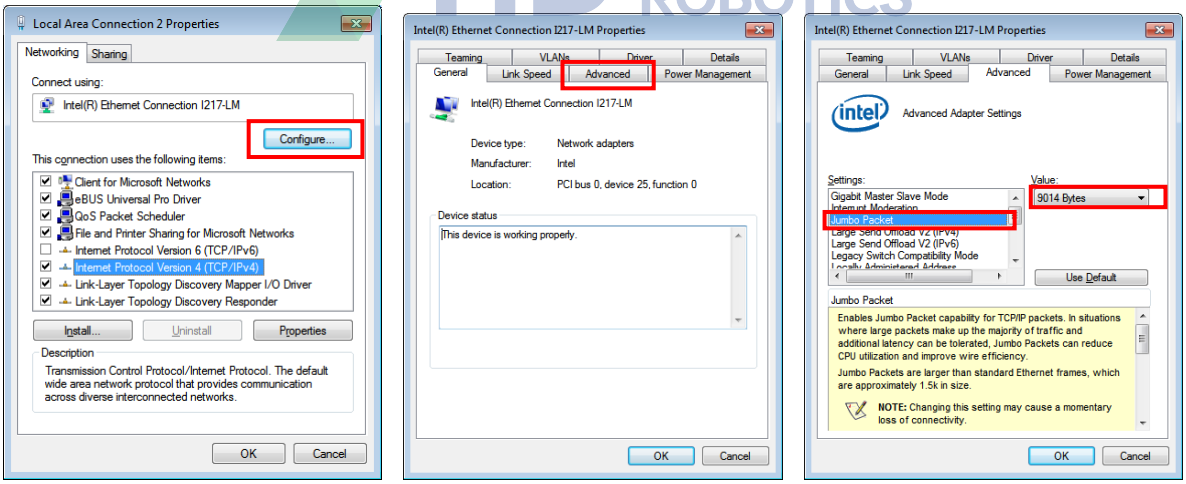


3.2. Set Network Adapter

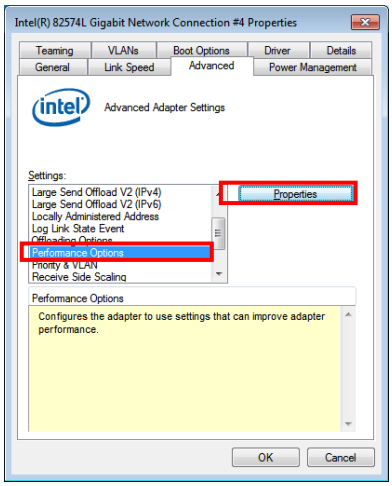
Set the properties of the network adapter to connect a camera.
Select Internet Protocol Version 4 in the Network Connection of Control Panel, and then click the [Property] button. Set the IP address and Subnet mask according to the configuration.

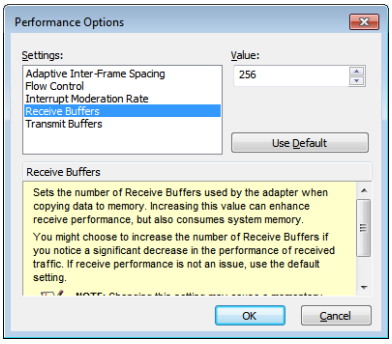


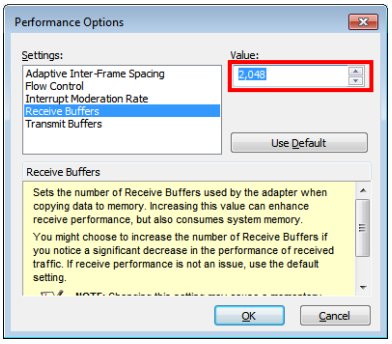
Click the [Configure] button and select “9014 Bytes”for the [Jumbo Packet], as follows:

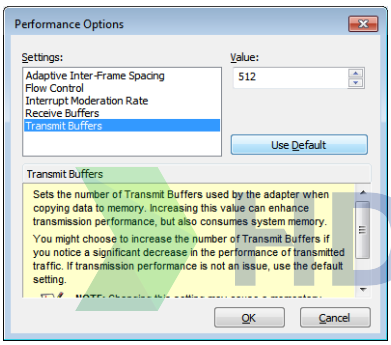


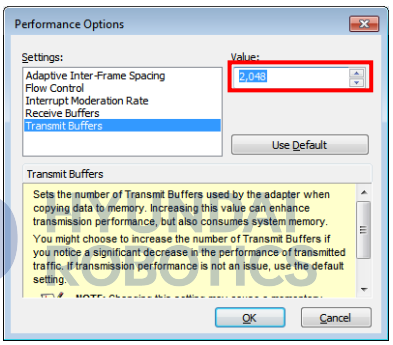
Set [Receive Buffers] and [Transmit Buffers] to 2048, respectively.


Intel(R) 82574L Gigabit Network Connection #4 Properties
Teaming
VLANs
Boot Options
Driver
Details
General
Link Speed
Advanced
Power Management
Advanced Adapter Settings
Settings:
Large Send Offload V2 (IPv4)
Large Send Offload V2 (IPv6)
Locally Administered Address
Log Link State Event
Offloading Options
Performance Options
Priority & VLAN
Receive Side Scaling
Properties
Performance Options
Configures the adapter to use settings that can improve adapter performance.
OK
Cancel


Performance Options
Settings:
Adaptive Inter-Frame Spacing
Flow Control
Interrupt Moderation Rate
Receive Buffers
Transmit Buffers
Value:
256
Use Default
Receive Buffers
Sets the number of Receive Buffers used by the adapter when copying data to memory. Increasing this value can enhance receive performance, but also consumes system memory.
You might choose to increase the number of Receive Buffers if you notice a significant decrease in the performance of received traffic. If receive performance is not an issue, use the default setting.
OK
Cancel

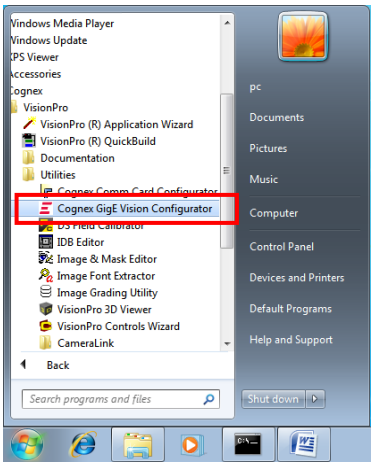

Performance Options
Settings:
Adaptive Inter-Frame Spacing
Flow Control
Interrupt Moderation Rate
Receive Buffers
Transmit Buffers
Value:
2,048
Use Default
Receive Buffers
Sets the number of Receive Buffers used by the adapter when copying data to memory. Increasing this value can enhance receive performance, but also consumes system memory.
You might choose to increase the number of Receive Buffers if you notice a significant decrease in the performance of received traffic. If receive performance is not an issue, use the default setting.
OK
Cancel


Performance Options
Settings:
Adaptive Inter-Frame Spacing
Flow Control
Interrupt Moderation Rate
Receive Buffers
Transmit Buffers
Value:
512
Use Default
Transmit Buffers
Sets the number of Transmit Buffers used by the adapter when copying data to memory. Increasing this value can enhance transmission performance, but also consumes system memory.
You might choose to increase the number of Transmit Buffers if you notice a significant decrease in the performance of transmitted traffic. If transmission performance is not an issue, use the default setting.
OK
Cancel

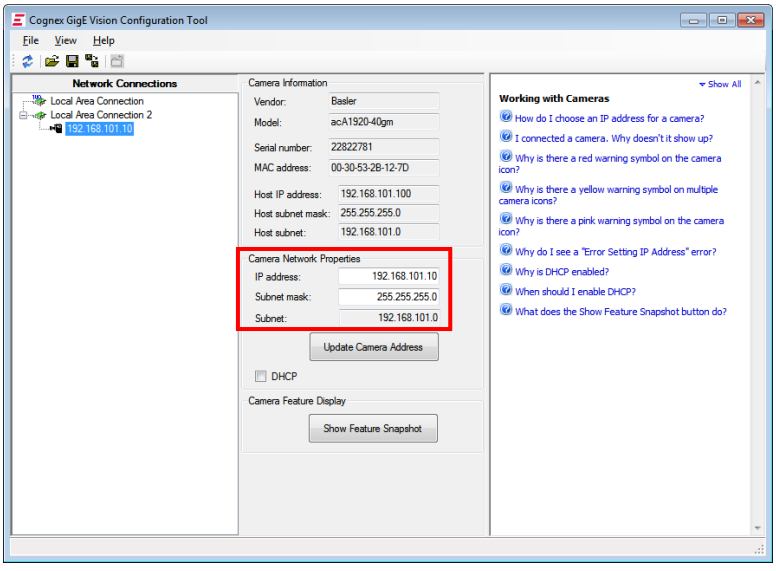

Performance Options
Settings:
Adaptive Inter-Frame Spacing
Flow Control
Interrupt Moderation Rate
Receive Buffers
Transmit Buffers
Value:
2,048
Use Default
Transmit Buffers
Sets the number of Transmit Buffers used by the adapter when copying data to memory. Increasing this value can enhance transmission performance, but also consumes system memory.
You might choose to increase the number of Transmit Buffers if you notice a significant decrease in the performance of transmitted traffic. If transmission performance is not an issue, use the default setting.
OK
Cancel

3.3. Set Camera IP

Click Windows [Start] ➔ [Cognex] ➔ [VisionPro] ➔ [Utilities] ➔ [Cognex GigE Vision Configurator], as follows:

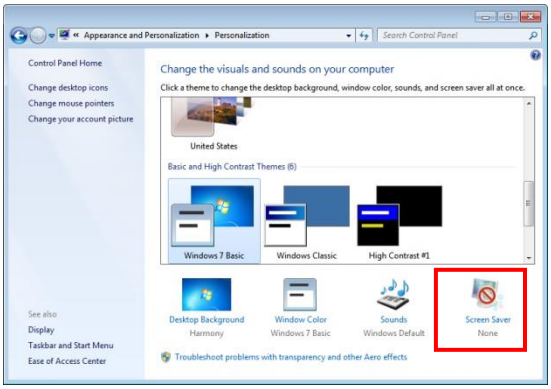


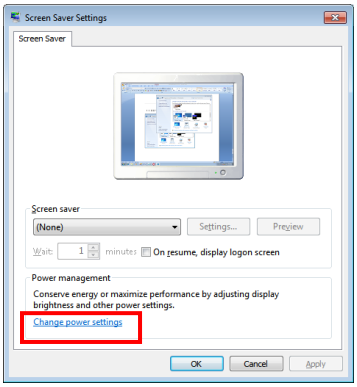
If the GigE Digital Camera is connected to a network adapter, you can view the camera IP setting. Set the IP address and Subnet Mask according to the installation environment. 192.168.101.10 is set as the camera IP address in the following example:



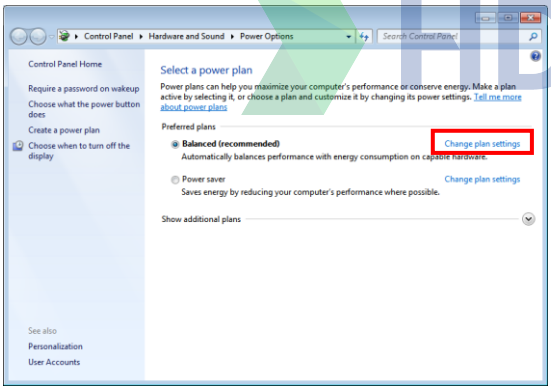
3.4. Turn Off Sleep Mode and Screen Saver

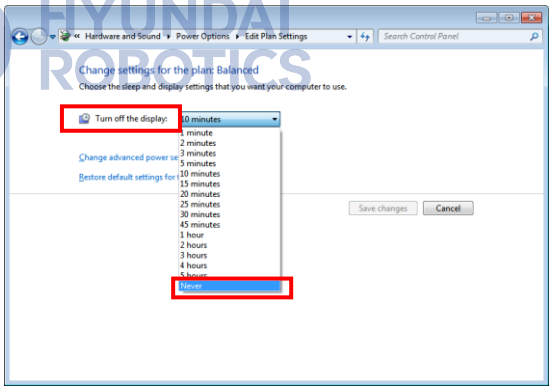
To prevent the display from turning off while the vision system is on standby, turn off the screen saver, as follows:

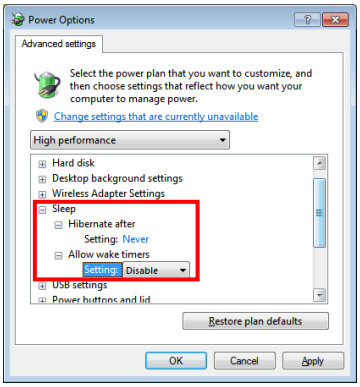




To prevent sleep mode while the vision system is on standby, change the sleep mode settings:







HYUNDAI ROBOTICS

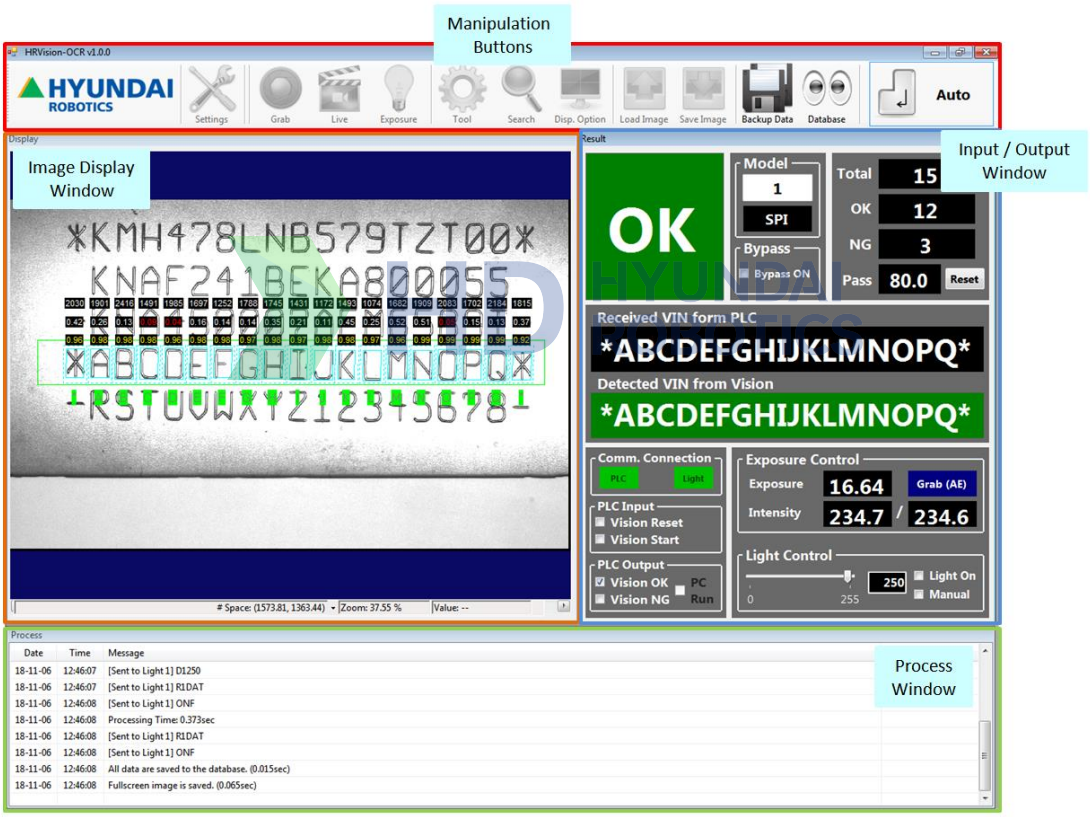
4 Basic Functions

4.1. Screen Configuration

HRVision-OCR shows the screen in English.

4.1.1. Main Screen

Upon entering the correct serial key after running the program, the following screen is displayed:
The HRVision-OCR screen consists of four windows. Each menu of control buttons opens an independent setting window.



The functions of individual windows are shown in the following table:

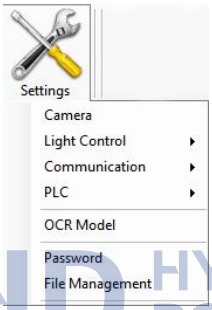
Manipulation Buttons	Settings, image recording, checking, and auto operation menus are provided to control HRVision-OCR.
Image Display Window	Live or grabbed image is displayed with the character recognition result.
Process Window	Hyundai robot controller, communication with lighting controller, states, and progress are displayed.
Input/Output Window	The state of connection and data between the vision system and PLC and lighting controller, model information, and character recognition

	results are displayed.

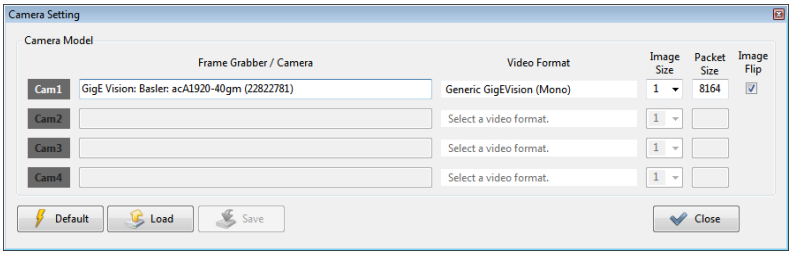
4.1.2. Manipulation Buttons

Control buttons are used to control functions of HRVision-OCR.

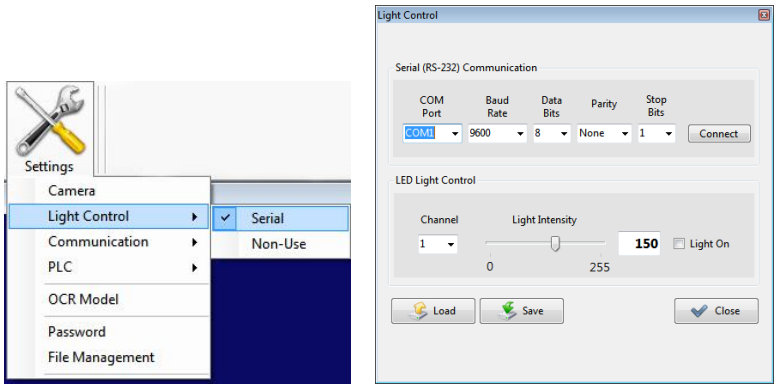
- Settings
  This menu is for configuring/managing different functions connected to Hardware (HW). There are seven submenus:



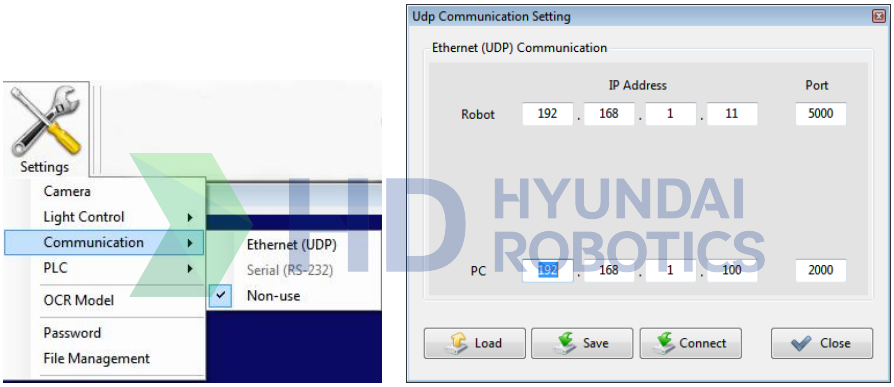
  - Camera
    The connected camera type, video format, and size are displayed. Click the Image Flip checkbox to grab a vertically inversed image.



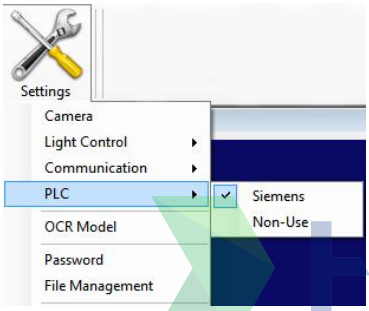
  - Light Control
    Serial communication variables can be set to control lighting.

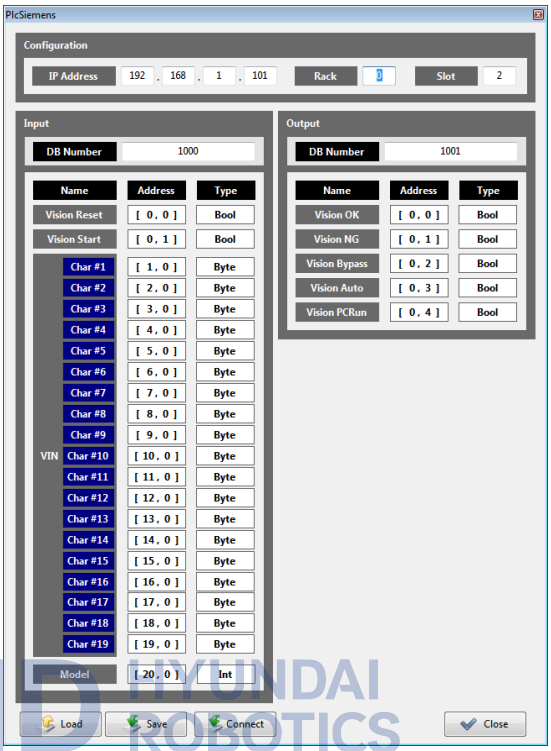


- Communication
  An IP and port can be set for Ethernet communication with a Hyundai robot controller.

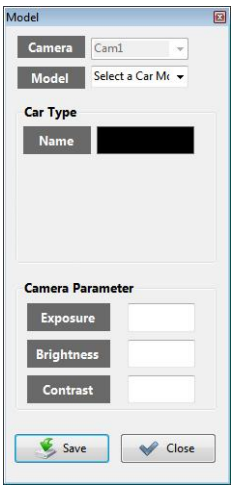


- PLC
  Configuration and data block can be set for communication through Siemens PLC.
  The following Input/Output data block address is fixed. Contact the supplier to add/remove signals.

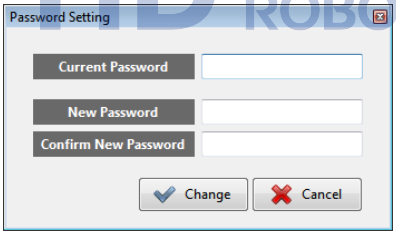

Settings
Camera
Light Control
Communication
PLC
OCR Model
Password
File Management
Siemens
Non-Use


PlcSiemens
Configuration
IP Address
192 . 168 . 1 . 101
Rack
0
Slot
2
Input
DB Number
1000
Name
Address
Type
Vision Reset
[0, 0]
Bool
Vision Start
[0, 1]
Bool
Char #1
[1, 0]
Byte
Char #2
[2, 0]
Byte
Char #3
[3, 0]
Byte
Char #4
[4, 0]
Byte
Char #5
[5, 0]
Byte
Char #6
[6, 0]
Byte
Char #7
[7, 0]
Byte
Char #8
[8, 0]
Byte
Char #9
[9, 0]
Byte
VIN
Char #10
[10, 0]
Byte
Char #11
[11, 0]
Byte
Char #12
[12, 0]
Byte
Char #13
[13, 0]
Byte
Char #14
[14, 0]
Byte
Char #15
[15, 0]
Byte
Char #16
[16, 0]
Byte
Char #17
[17, 0]
Byte
Char #18
[18, 0]
Byte
Char #19
[19, 0]
Byte
Model
[20, 0]
Int
Output
DB Number
1001
Name
Address
Type
Vision OK
[0, 0]
Bool
Vision NG
[0, 1]
Bool
Vision Bypass
[0, 2]
Bool
Vision Auto
[0, 3]
Bool
Vision PCRun
[0, 4]
Bool
Load
Save
Connect
Close

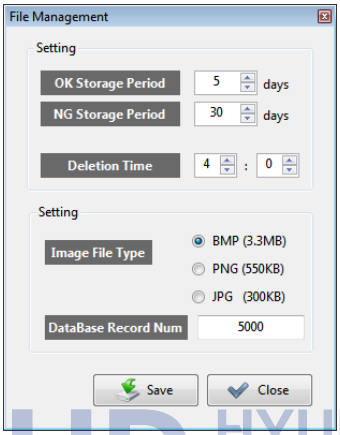
- OCR Model
  Model-specific [Exposure], [Brightness], or [Contrast] can be set.



- Password
  Password can be changed. Contact the supplier for the default password.



- File Management
  The Image save cycle and deleting time can be set to OK or NG while recognizing characters. Deleting data can overload the system, so it is recommended to set the deleting time when the robots don't work.
  Image files can be saved in [BMP], [PNG], or [JPG] formats. The number of database records can be limited.



■ Grab
If a camera is connected, the image is grabbed once and displayed in the Image Display Window.

■ Live
If a camera is connected, the continuous image is displayed in the Image Display Window.

■ Exposure
There are three types of exposure modes:

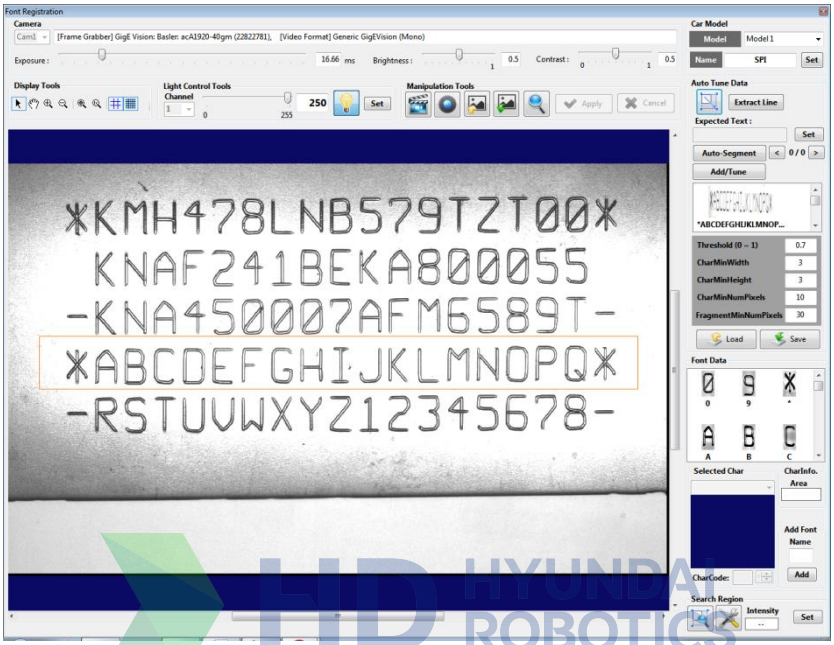
- Registered Exposure
  Image will be grabbed with the exposure for font registration.

- Auto Exposure
  The exposure level is automatically changed for the brightness of the image for font registration and the current one to be similar. Up to five images can be grabbed in this mode.

- User Exposure
  Images will be grabbed with the exposure defined in the OCR Model menu.

■ Tool

– Setting window to register fonts by models. Detailed functions will be explained in 4.2



■ Search

If a font is registered for the model, an image is grabbed and then the characters are recognized.

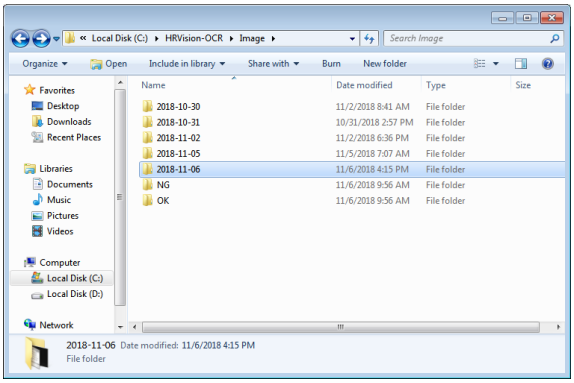
■ Load Image

A dialog window will be displayed to load images, and an image of the selected [BMP] file will be displayed in the Image Display Window.

■ Save Image

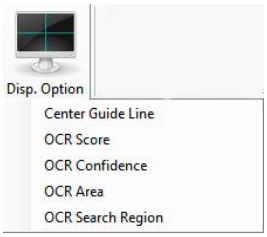
Grabbed images will be stored in the Image Display Window.

Image files will be stored in the [Date Folder] of“C:/HRVision-OCR/Image”, with a file name, including the execution time and model name.

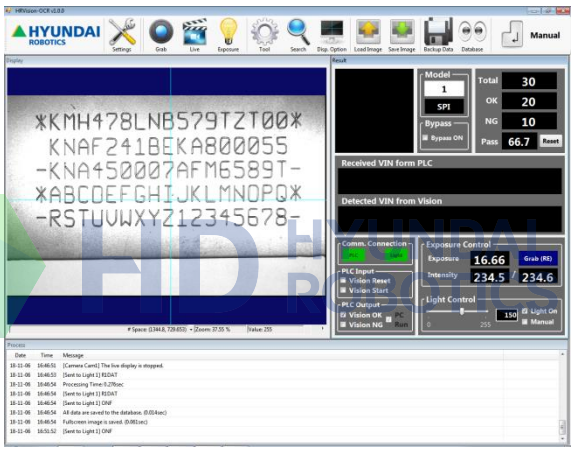


■ Display Option

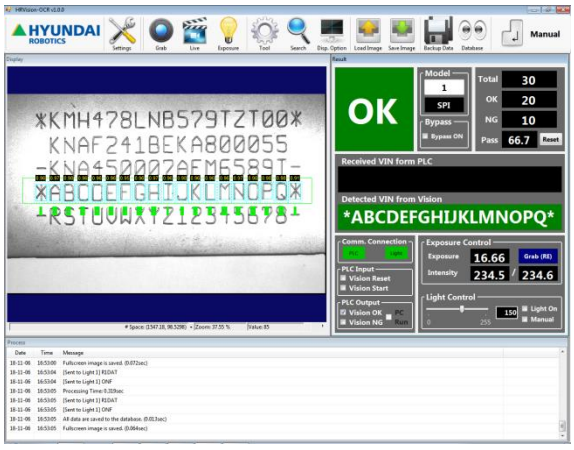
Additional information will be displayed for image and result outputs.



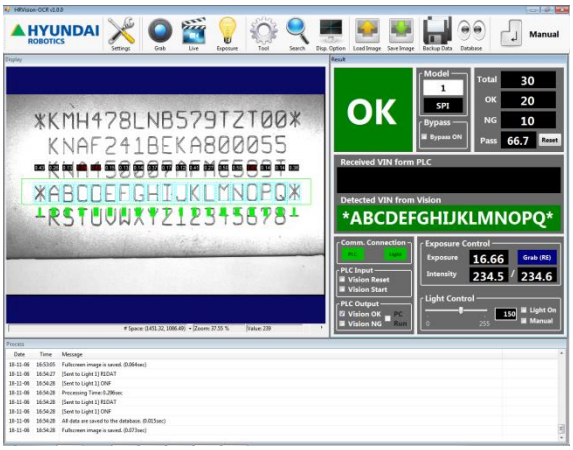
- Center Guide Line
  A Guide Line will be displayed in the center of the Image Display Window, as shown below:



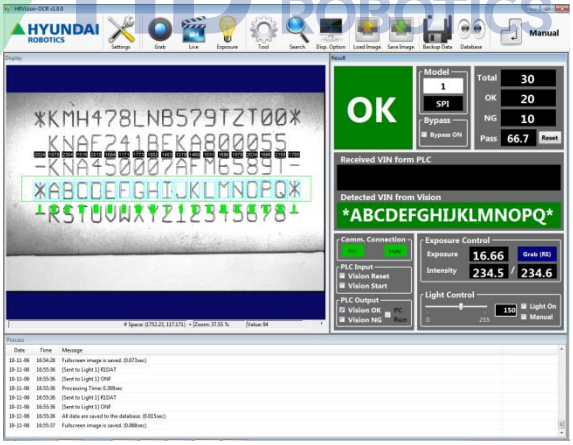
- OCR Score
  The match rate will be displayed on top of recognized characters during character recognition.



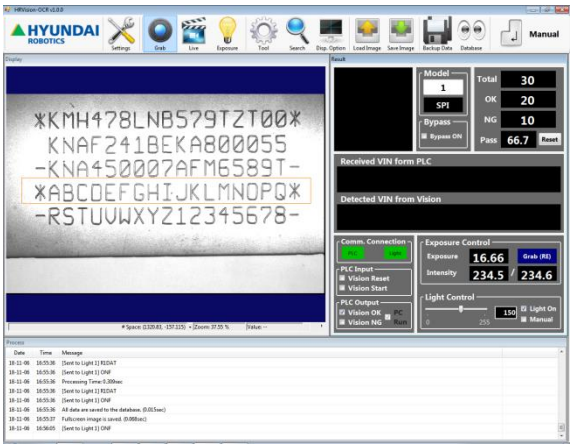
- OCR Confidence
  Confidence will be displayed on top of recognized characters during character recognition. Confidence is a variable to show the degree of similarity with other characters.



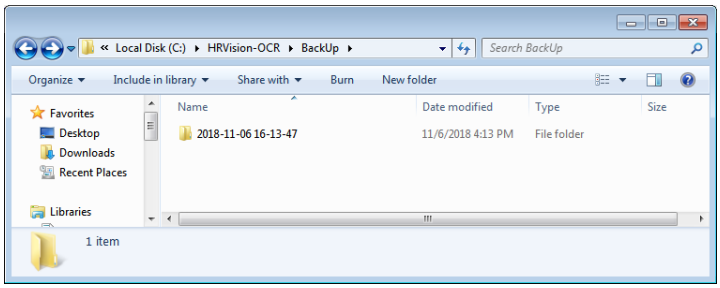
- OCR Area
  The area of characters will be displayed on top of the recognized characters during character recognition.



- OCR Search Region
  If a fond model is registered, a defined search area will be displayed in orange for both Grab and Live.

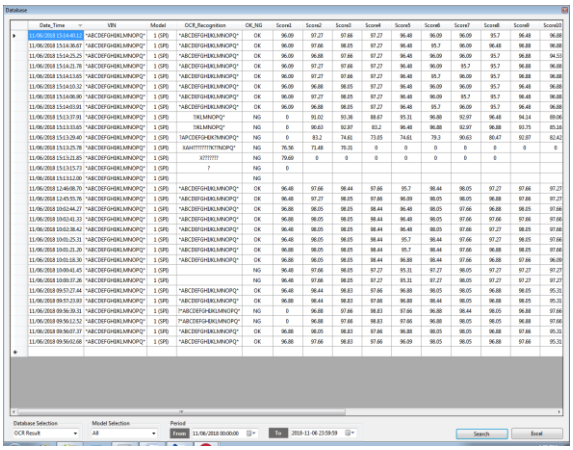


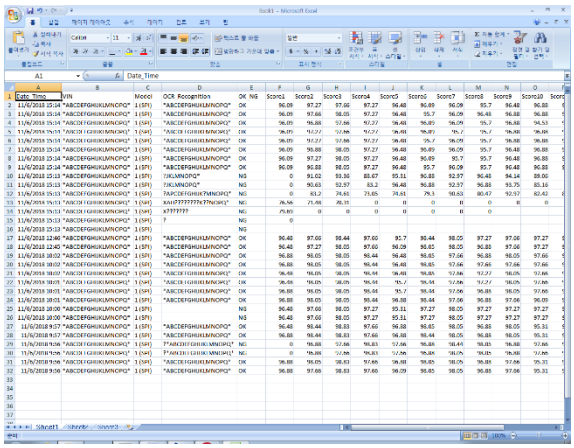
■ Data Backup
All data in the Data folder will be saved in a new execution time folder in "C: /HRVision-OCR/Backup". Here is an example of [Backup Data].



■ Database

A search window is displayed for error and measured database.
Searched data can be displayed with the “Microsoft Excel” program.





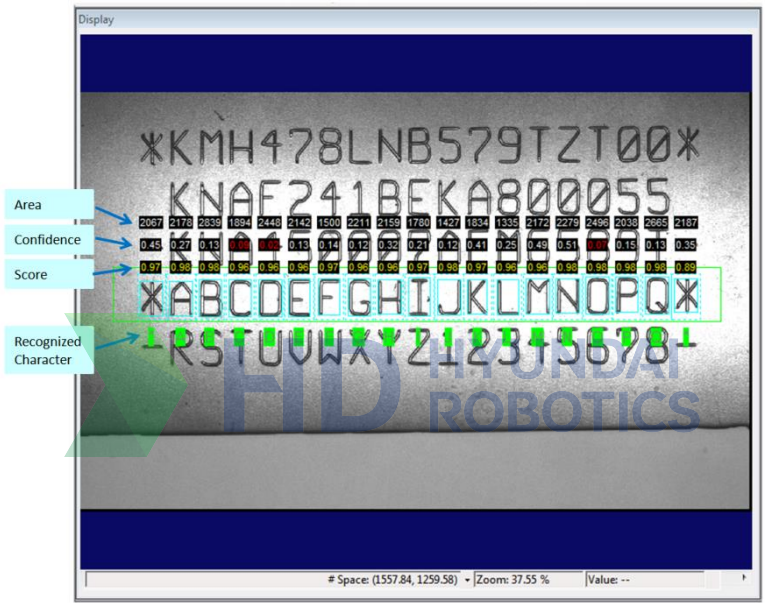
■ Manual/Auto

The Manual/Auto modes can be switched. In Auto mode, all the buttons are not available, but it can be controlled only through communication with a PLC or robot controller.

4.1.3. Image Display Window

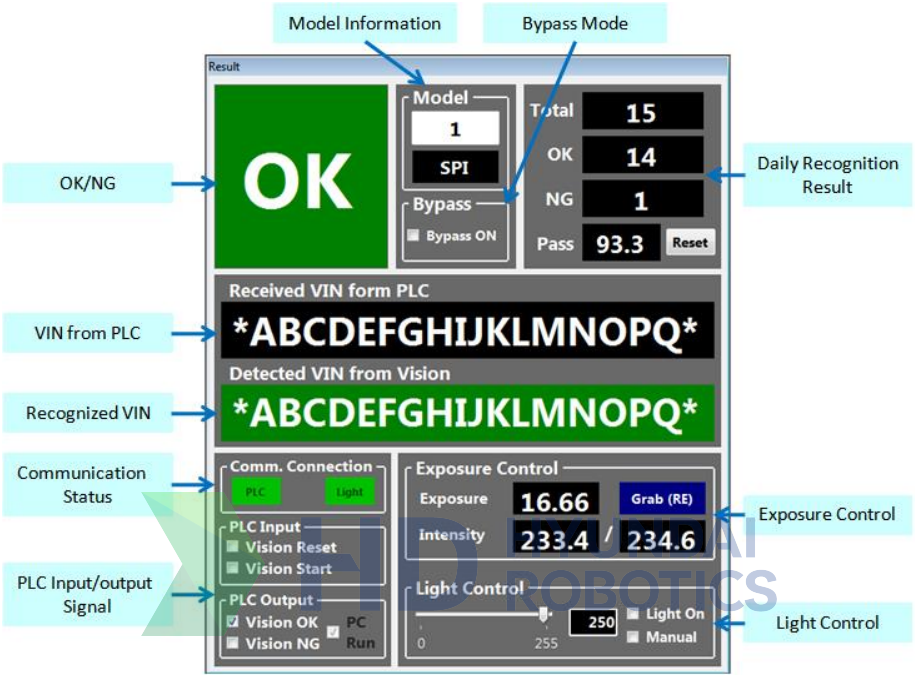
Image window displays continuous images or the currently grabbed image with character recognition results: [Score], [Confidence], and [Area].

In the image window, you can Zoom In / Zoom Out, Fit Image, and perform Image Exploration with the mouse control.



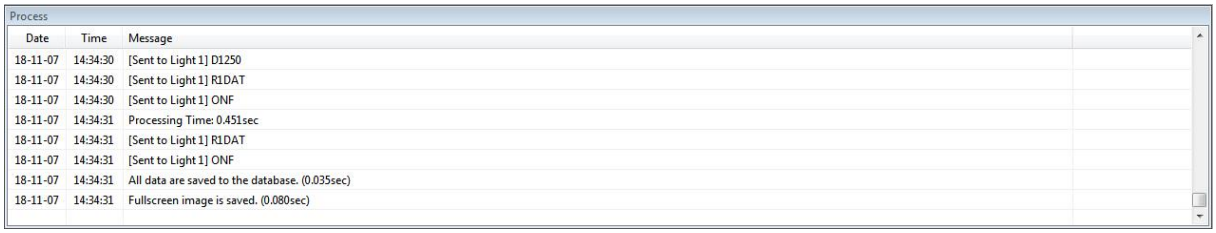
4.1.4. Input/Output Window

Input/Output window displays character recognition result, model information, communication connection state, PLC input/output signal monitoring and control, lighting control function, and exposure control state.



4.1.5. Process Window

Operation state of HRVision-OCR and communication state with external devices are displayed.



4.2. Functions

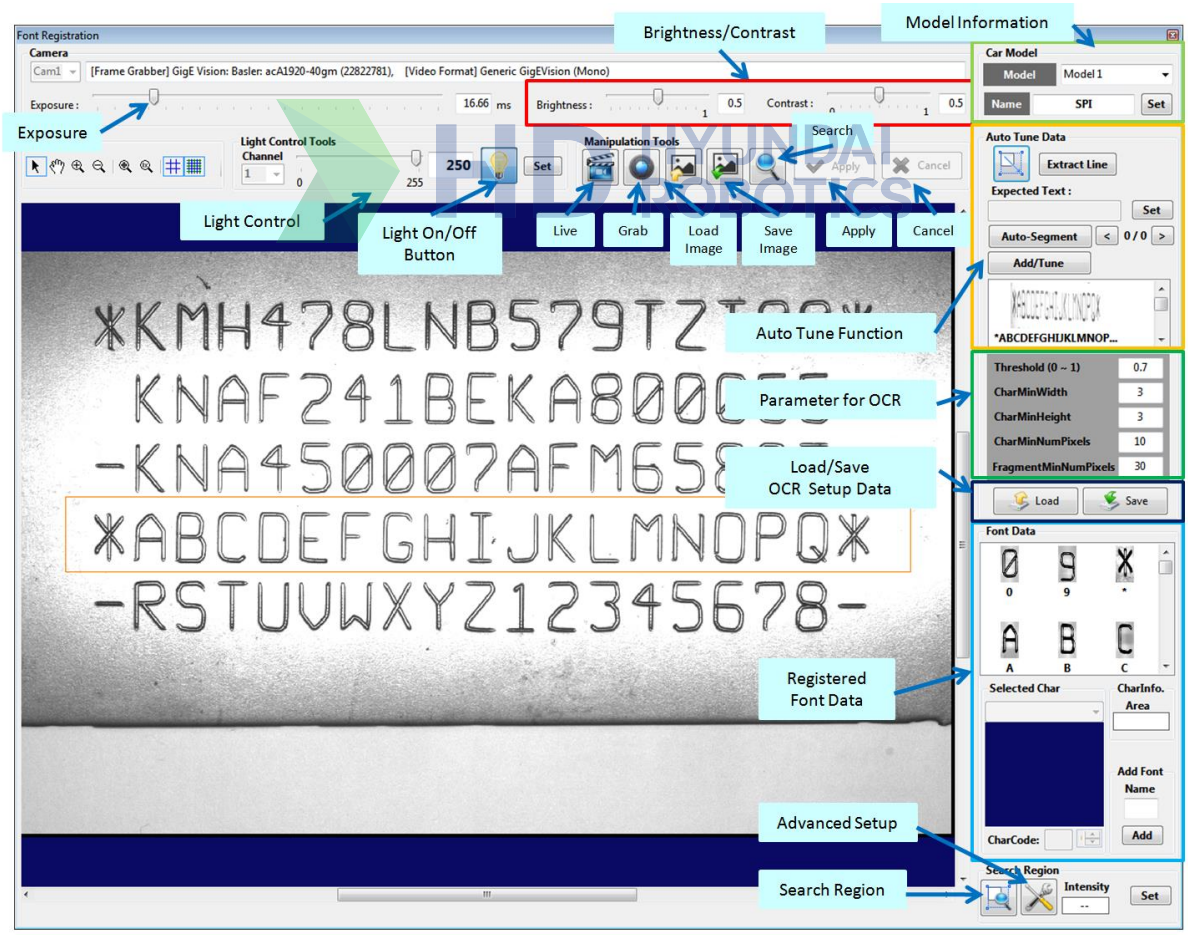
4.2.1. Font Registration and Variable Setting for Character Recognition

This function is used to register fonts for character recognition.

Click the [Tool] button of the Manipulation button to open the Pattern Registration window.

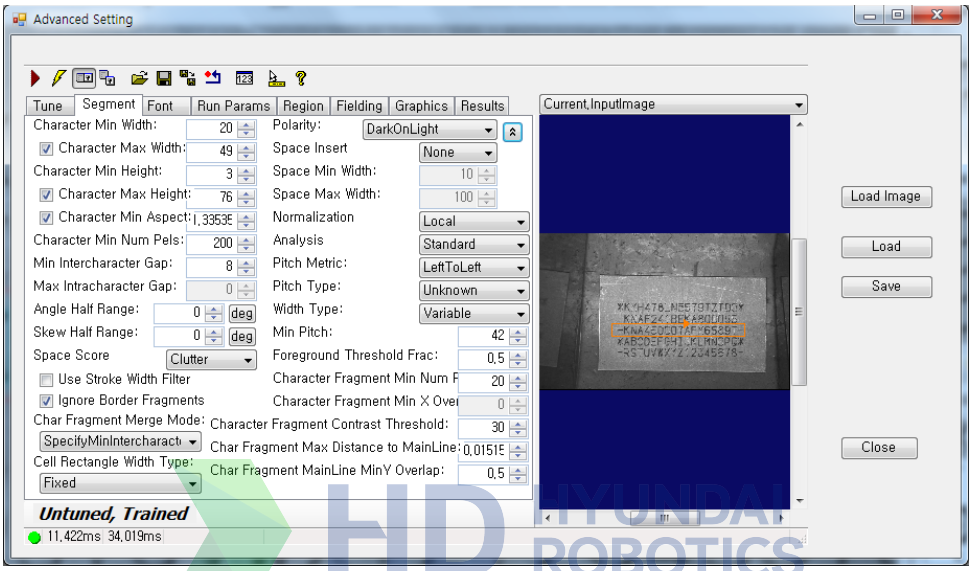
The camera will first grab printed or imprinted characters of the workpiece.
Adjust the exposure and lighting brightness according to the environment when grabbing images.

Register fonts for individual characters with the auto variable setting (Auto Tune) and individual font registration functions.



4.2.2. Advanced Setup

Use the [Advanced Setup] function to tune character recognition variables according to the operation environment and manage additional fonts, as follows:



Detailed procedures of font registration and character recognition will be explained in Chapter 5.

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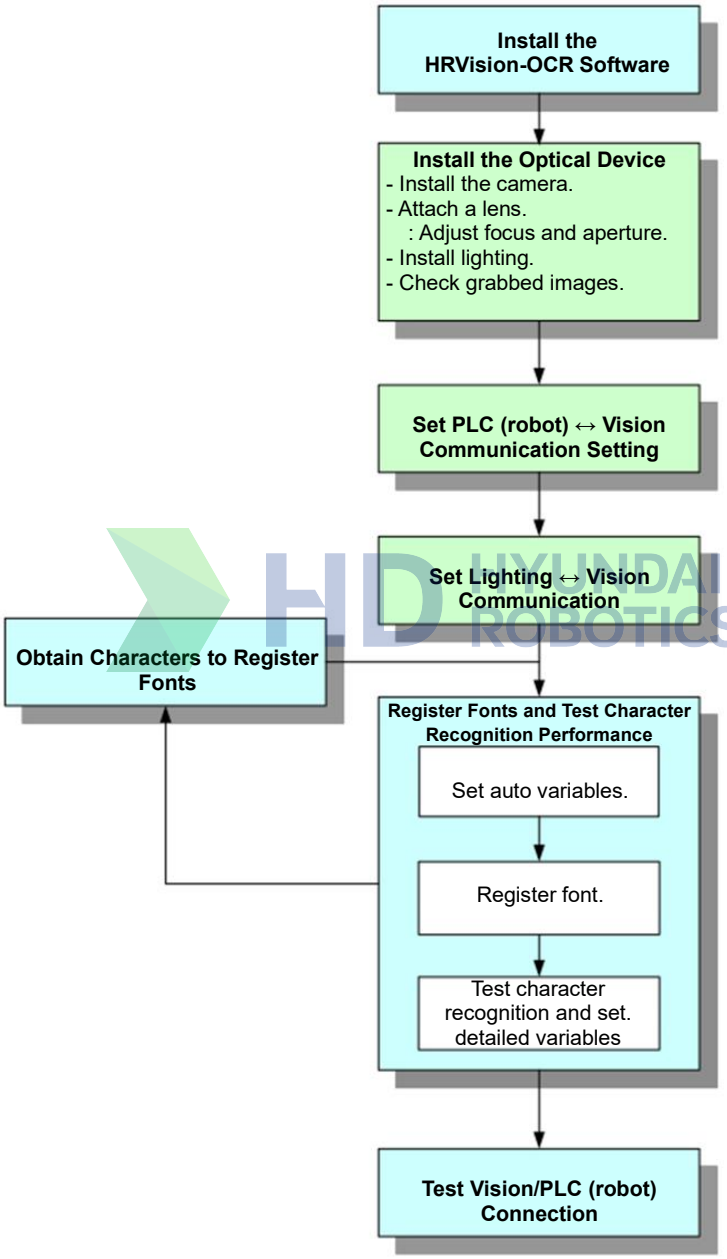
5 Operation Procedure

5. Operation Procedure

Here is the operation procedure for HRVision-OCR.
A detailed explanation of procedures will be provided in the following respective sections:



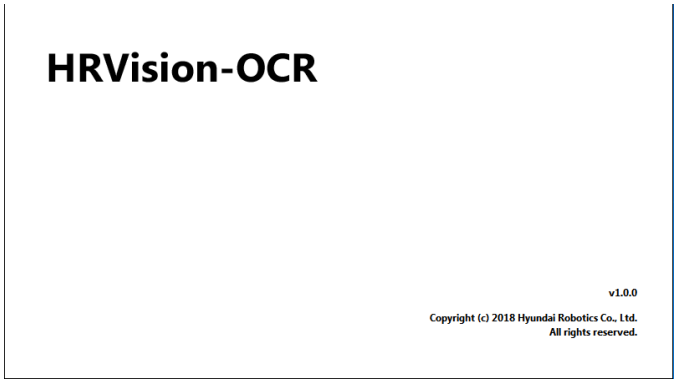
5.1. Install HRVision-OCR Software

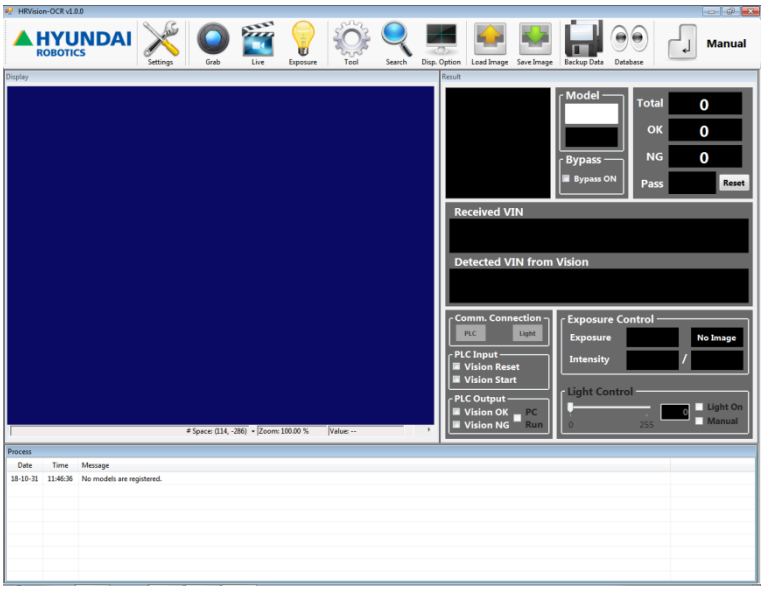
Install “VisionPro 9.0” and “HRVision-OCR” software according to 1.2.2., and register a license key according to 2.1.

5.2. Install Optical Device

Install cameras and lighting.

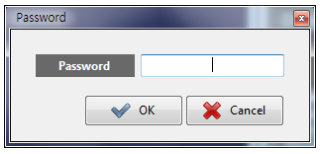
According to the camera setting procedure in Chapter 3, turn off the firewall and set the network adapter and camera IP. After setting the camera, run “HRVision-OCR” to run “HRVision-OCR” with the following splash screen:



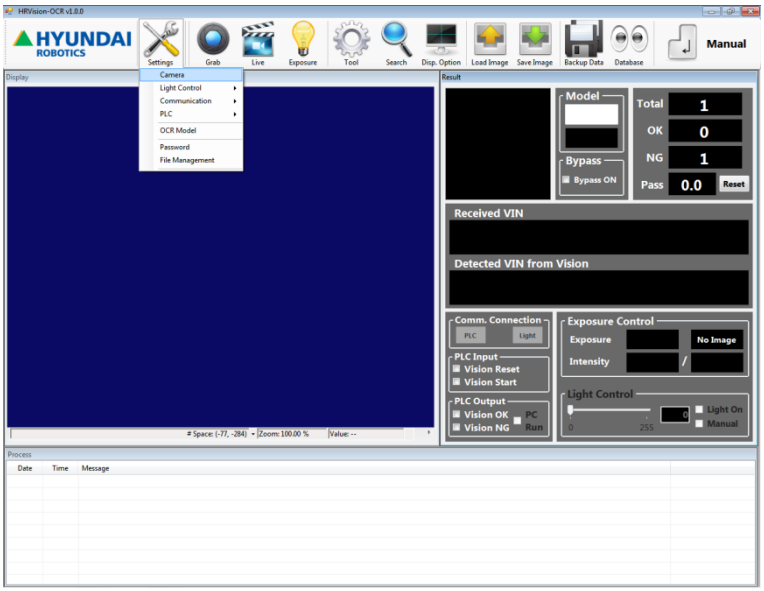


In the initial screen, an abnormal image is recorded because the camera type is not configured. Check the camera type in the “Setting” menu.

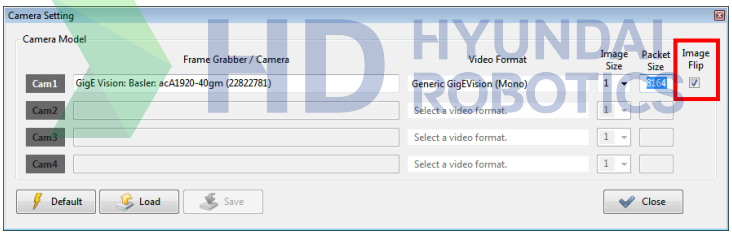
The “Settings” and “Tool” setting menus require a password.
Contact the seller for the default password.



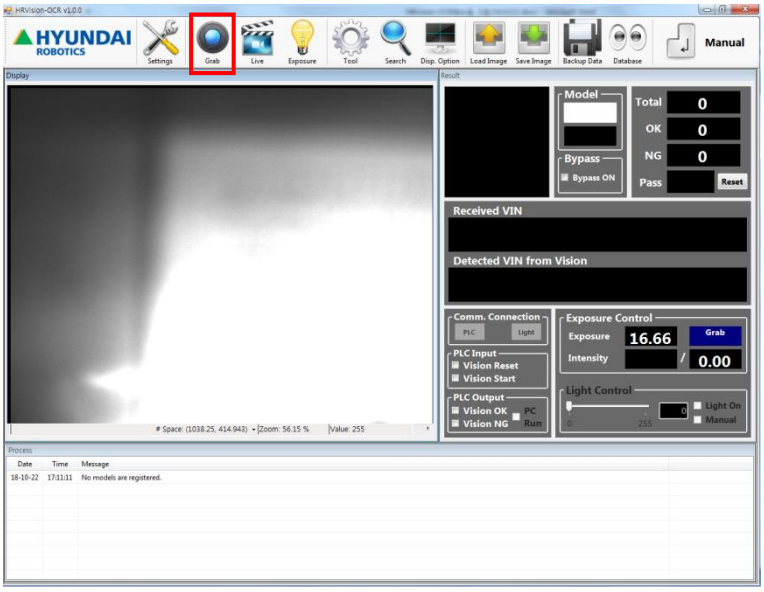
By clicking “Settings → Camera,” the following dialog is created:
Set and save a suitable camera type for process environment.

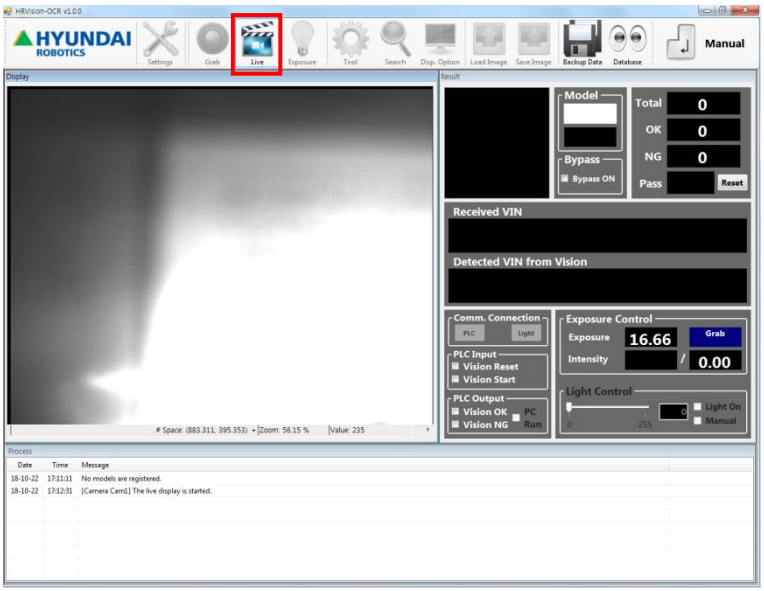


If the installed camera is inversed, click the Image Flip checkbox to inverse the image.



By clicking the [Grab] and [Live] buttons, check if the normal image is recorded.
Click [Live] to disable other buttons. Once the continuous image is checked, click the [Live] button again to finish grabbing the continuous image.





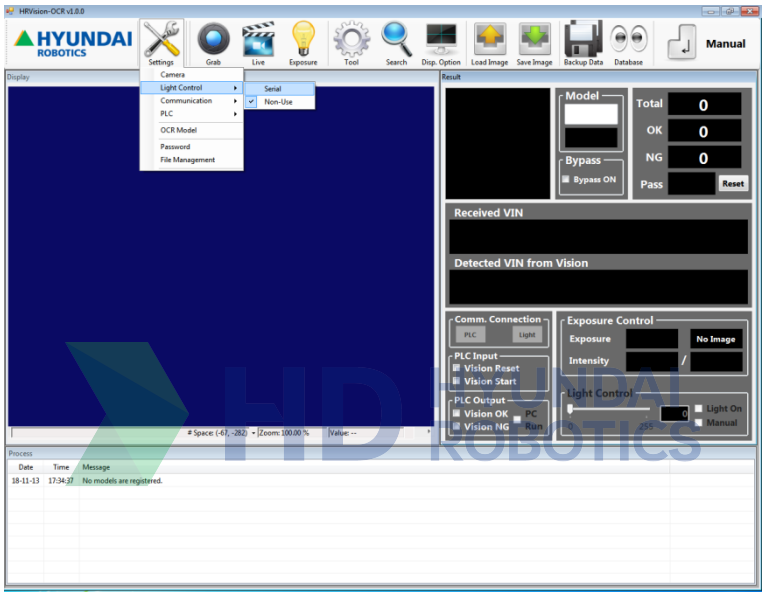
To grab an optimal image, set lens focus and aperture in consideration to the distance between the workpiece, the camera, and the environment.
Fix the camera and check the focus and aperture rings to prevent gaps.
After installing the vision, check if the normal image is recorded when the peripheral equipment is operated.
If there is noise in the image, check the connection and insulation of the camera and cable.

5.3. Set HRVision-OCR Communication

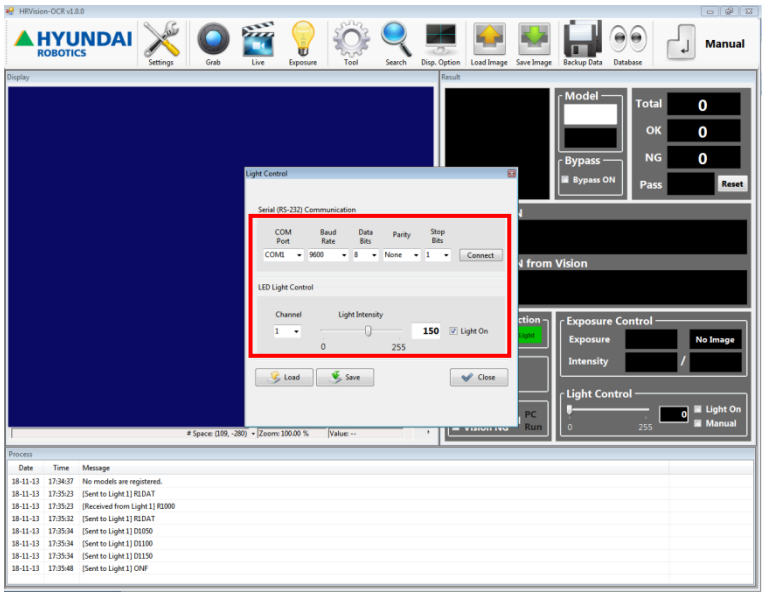
5.3.1. Set Lighting Communication

Once an image is grabbed, set the communication for “HRVision-OCR.”

Click “Settings → Light Control → Serial” to set serial communication for lighting control. Check and then set Com port connection to PC. The Baud rate is 9600.

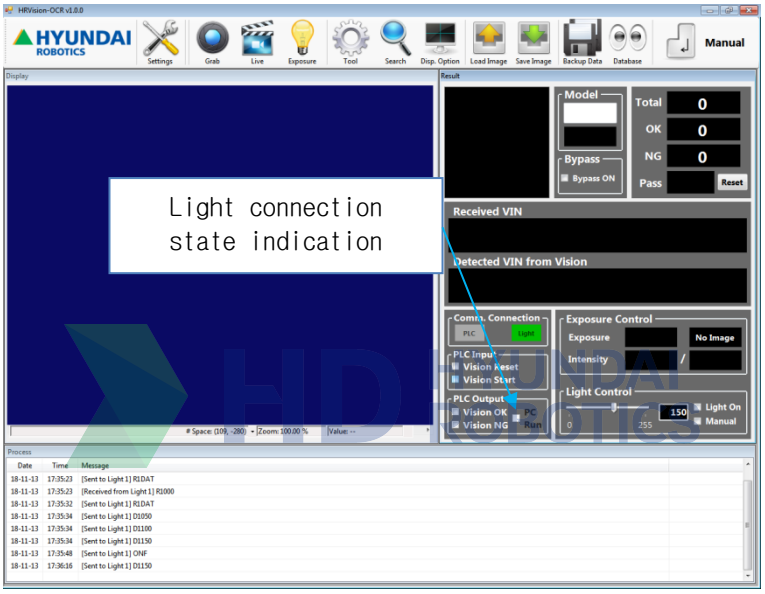


If the connection is correct, click the [Connect] button to communicate with the lighting controller. Check if the lighting can be controlled with the HRVision-OCR with the “Light Intensity”and “Light On” checkboxes.



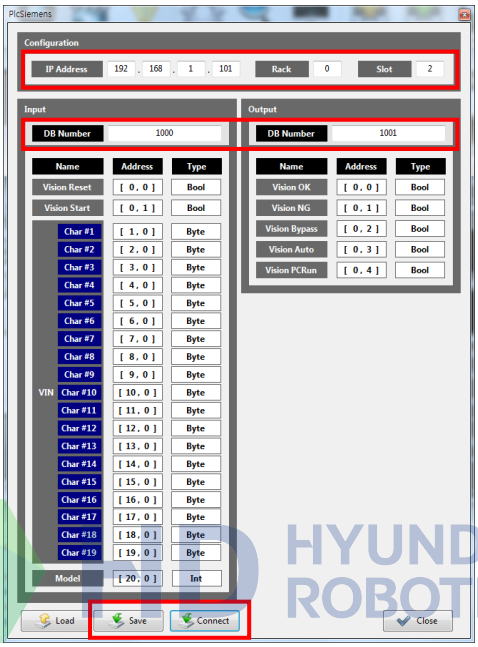
If the optimal Light Intensity value is confirmed, click the [Save] button to save the serial communication settings for the lighting connection. Configure these settings only once in the beginning. The stored setting data is automatically loaded to communicate with the lighting controller whenever the HRVision-OCR SW is run.

Once the lighting controller is successfully connected, the light connection state becomes green in the Input/Output Window, as follows:

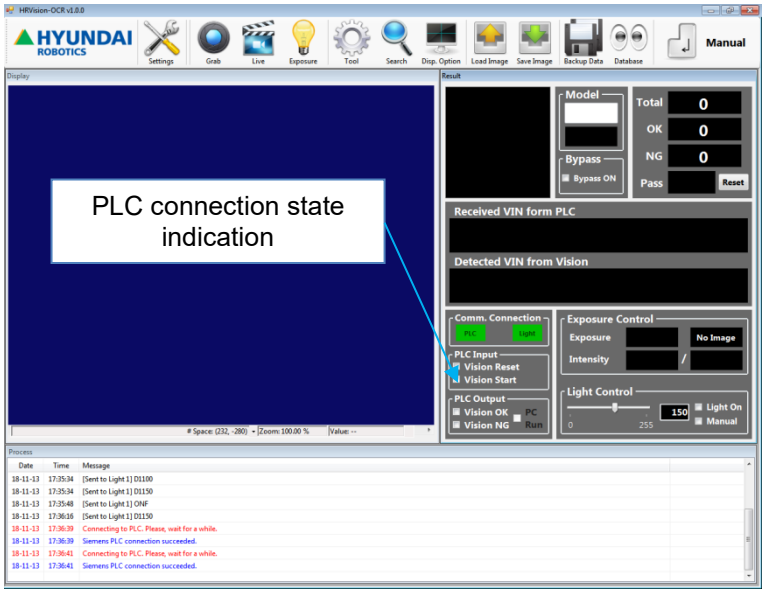


5.3.2. Set PLC Communication

To connect with Siemens PLC, enter the IP, Rack, Slot, and Input/Output Data Block Number for Siemens PLC and then click the [Connect] button.



Once the PLC is successfully connected, the PLC connection state becomes green in the Input/Output Window, as follows:

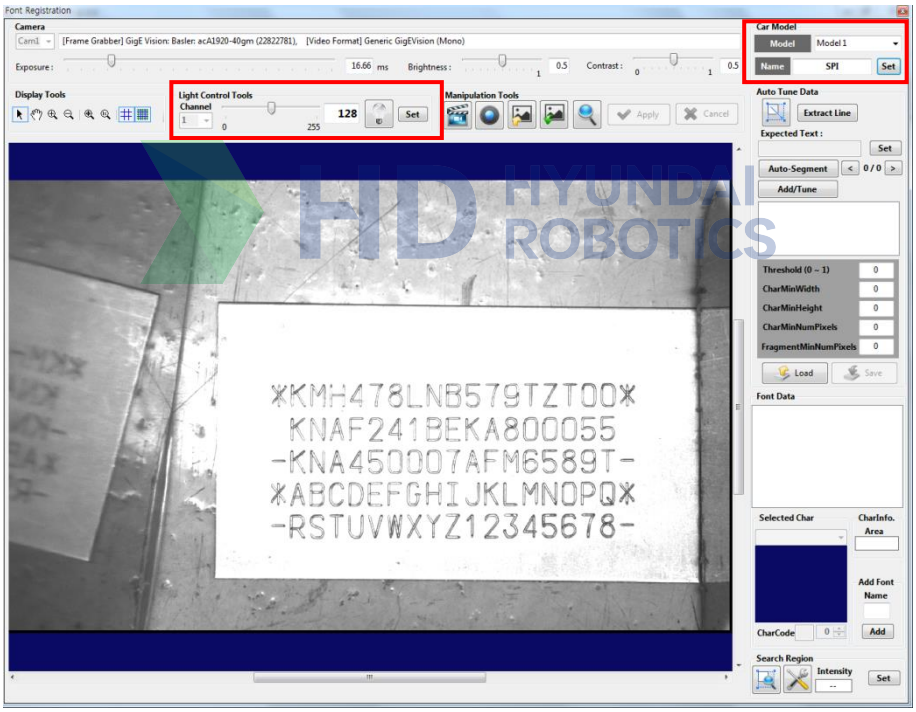


5.4. Register Font

The character recognition function is managed for individual models.

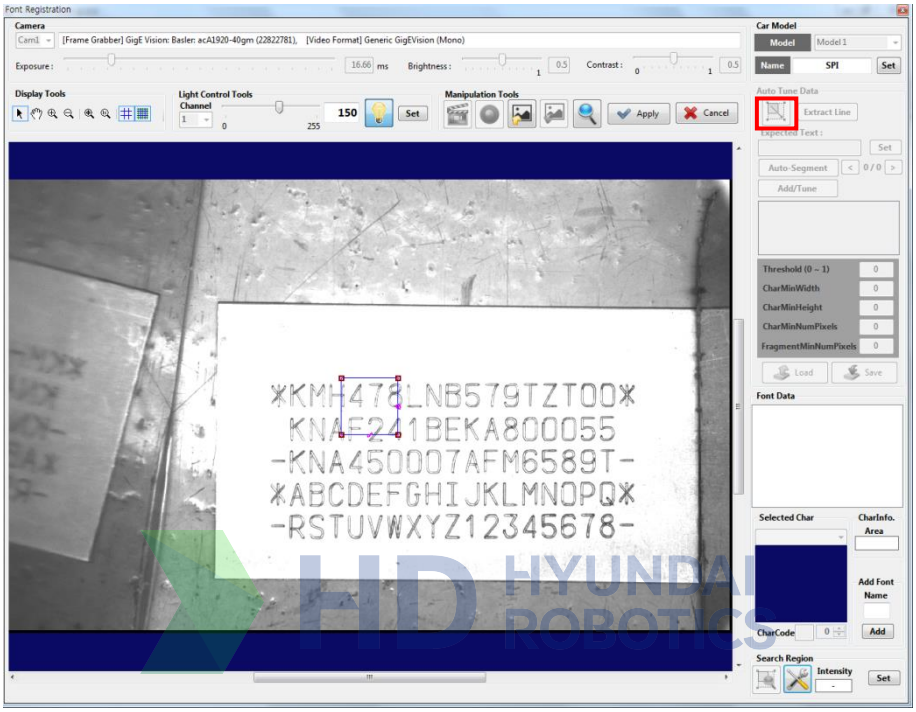
Characters are recognized by comparing the similarity of the currently grabbed image with fonts of individual preregistered characters.
The character recognition setting procedure is as follows:

Click the [Tool] button to open the Font Registration window.
Enter the Model No. and Model Name and then click the [Set] button. Set suitable lighting value to recognize characters with Light Control Tools and click the [Grab] button and then the [Live] button to check the image. Once the lighting is configured, click the [Set] button.

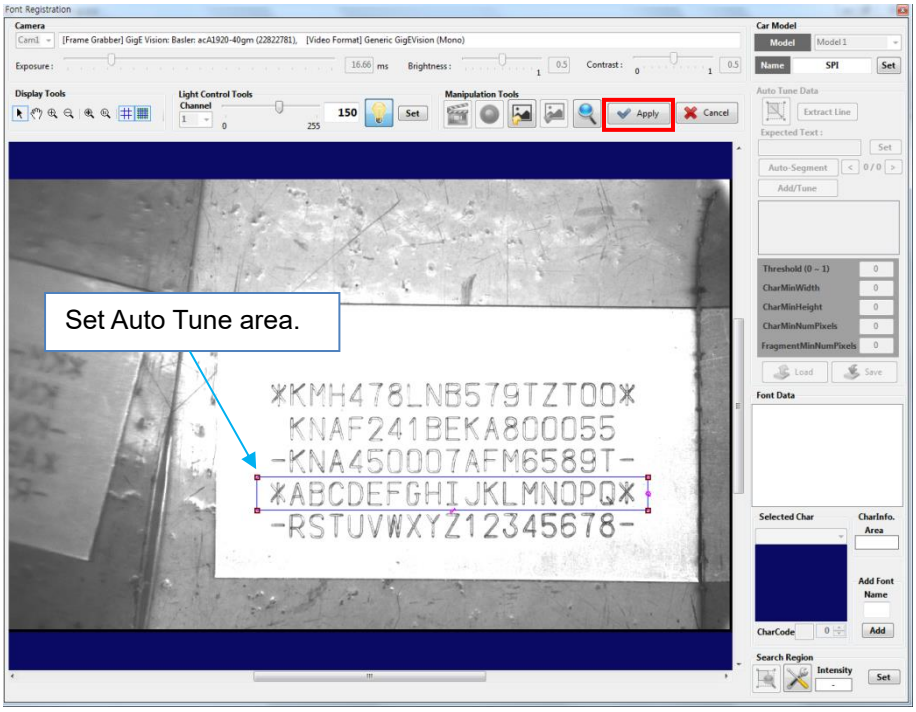


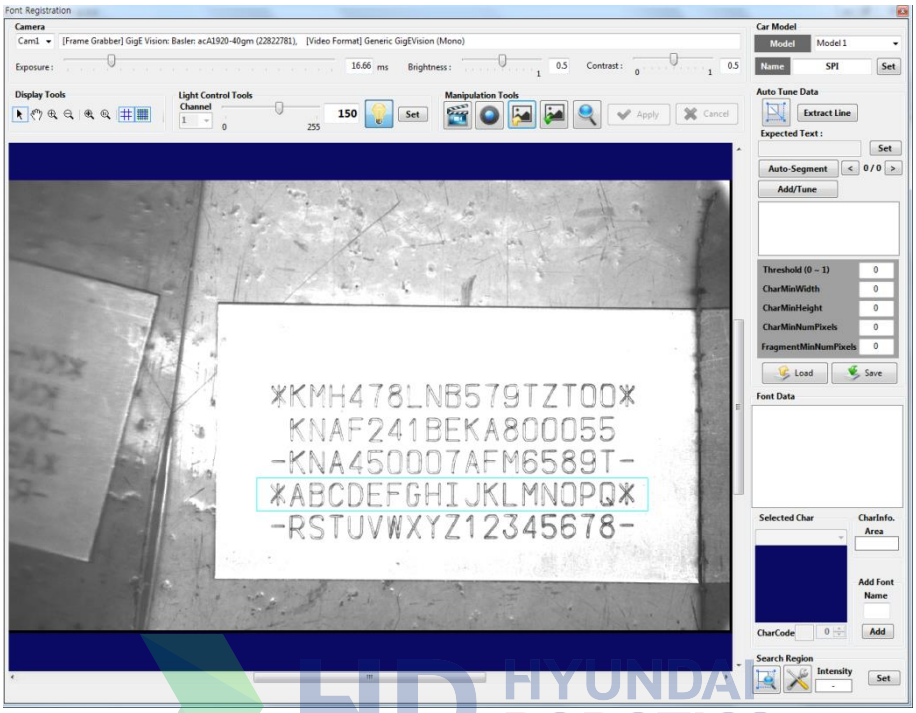
5.4.1. Register Font with Auto Tune

Click the [Setup Character Region] button of Auto Tune Data. A variable rectangle is created, as shown below:

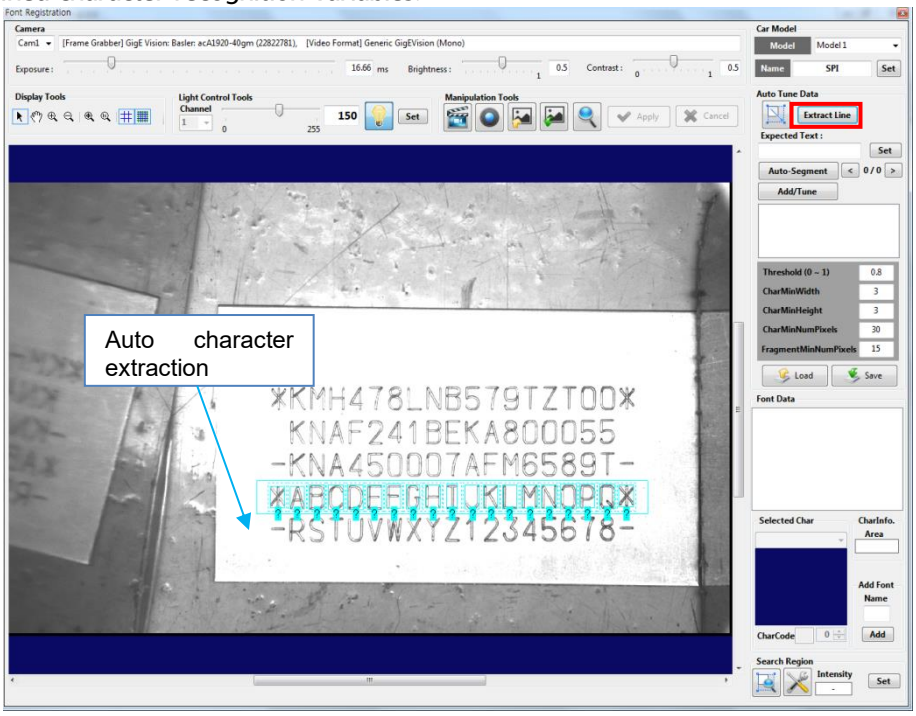


Position the rectangle on the character area to register a font, and then click the [Apply] button.



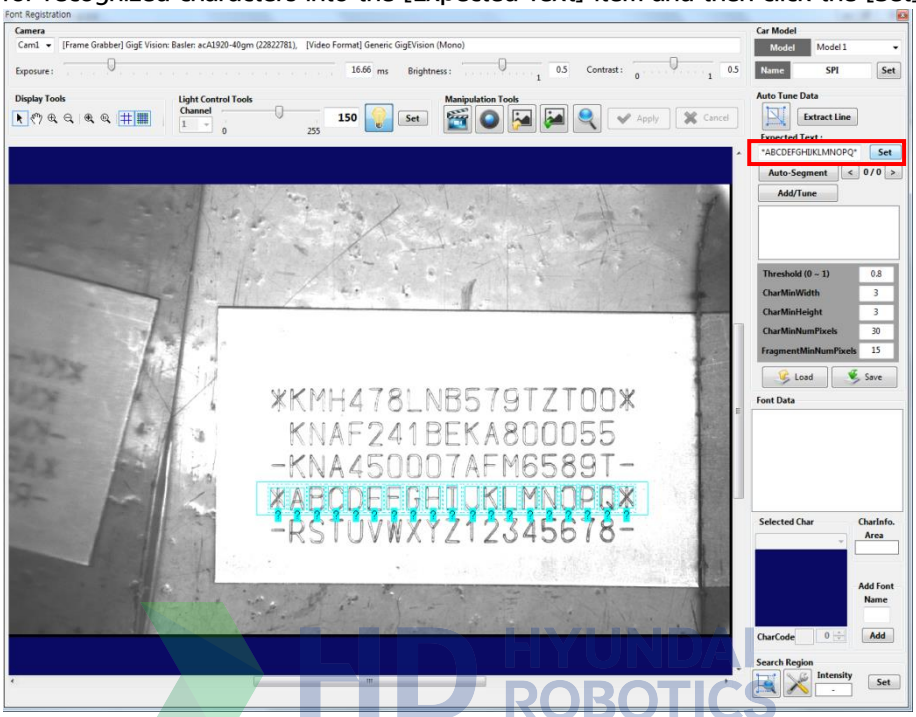


Click the [Extract Line] button to automatically extract characters in the defined area according to currently defined character recognition variables.

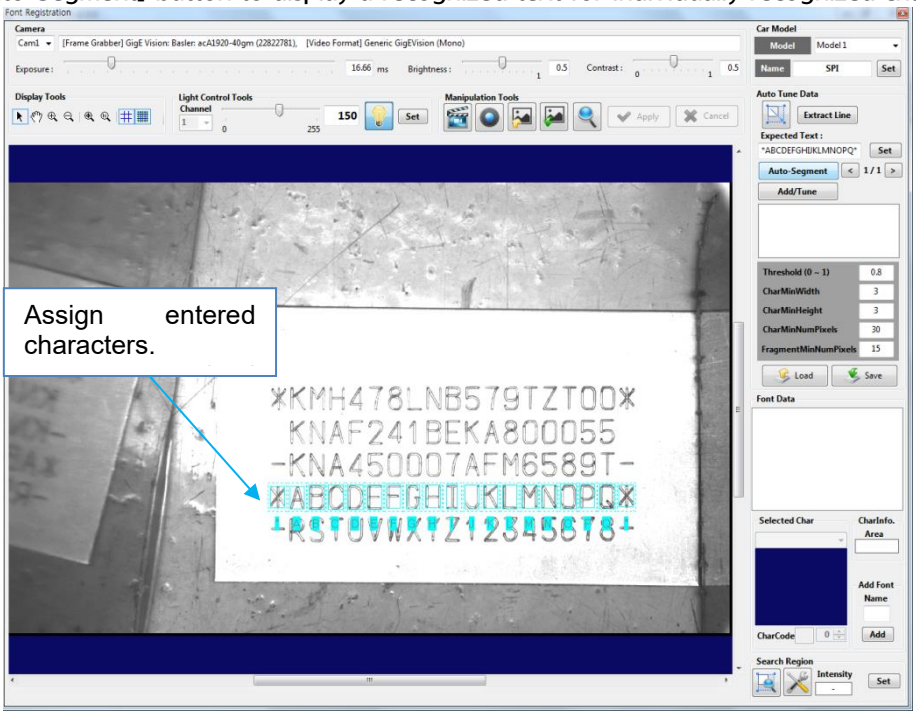


If all characters are not recognized in the area, change the OCR variables to recognize all characters.

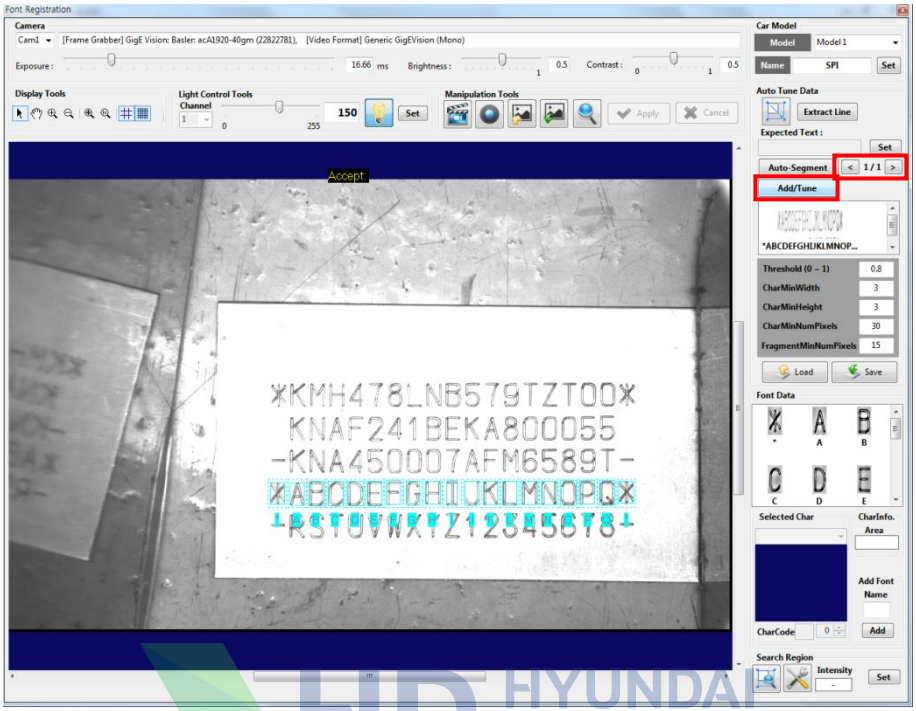
Enter letters for recognized characters into the [Expected Text] item and then click the [Set] button.



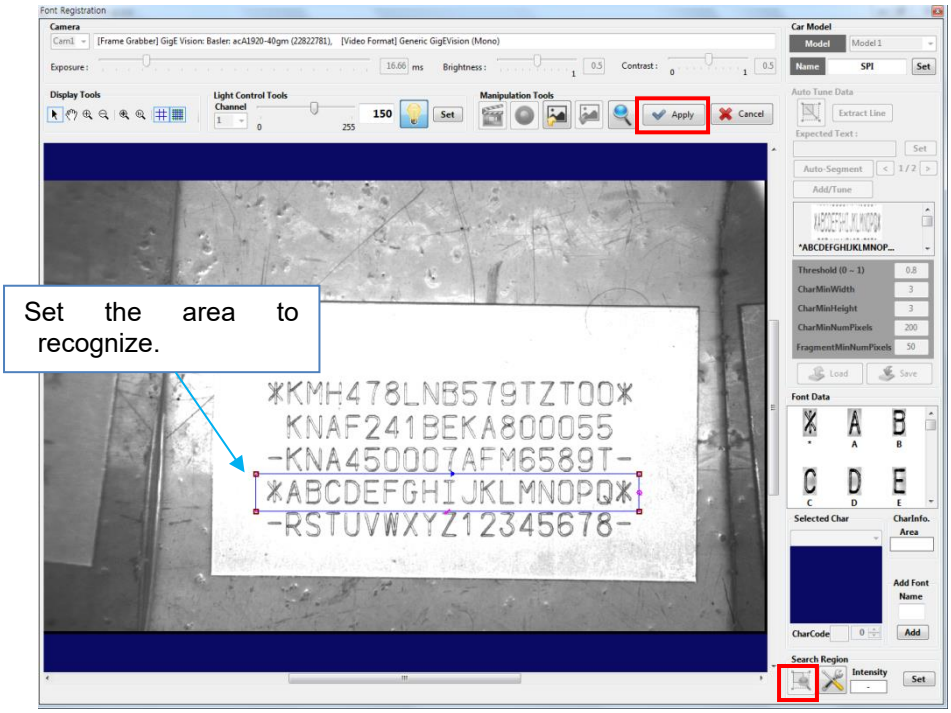
Click the [Auto-Segment] button to display a recognized text for individually recognized characters.



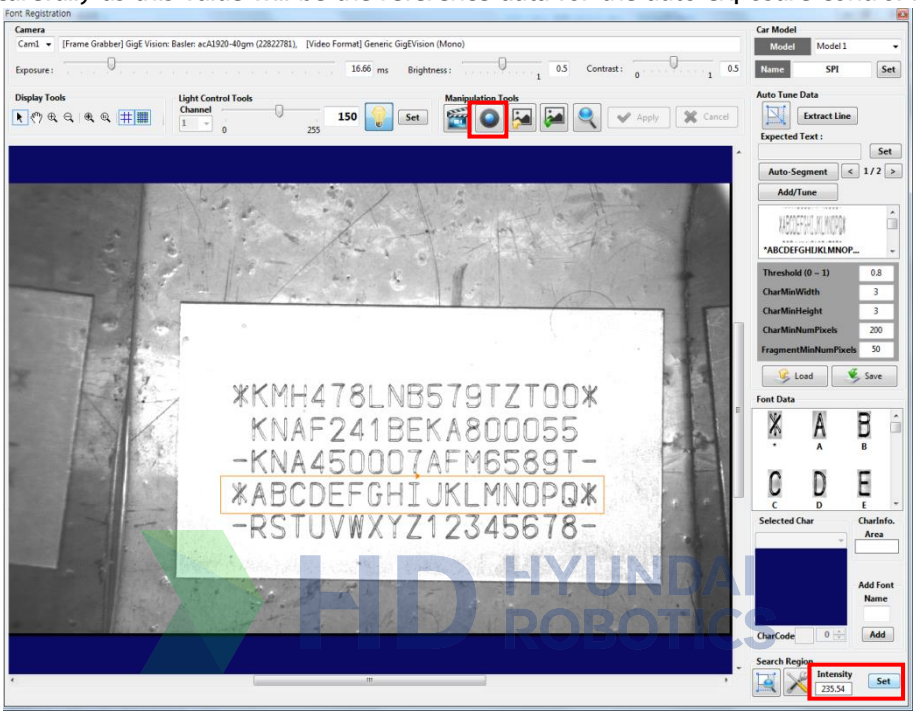
For some cases, multiple [Auto-Segment] results can be output. Click the left/right arrow to select results within the character area, and then click the [Add/Tune] button to register fonts.



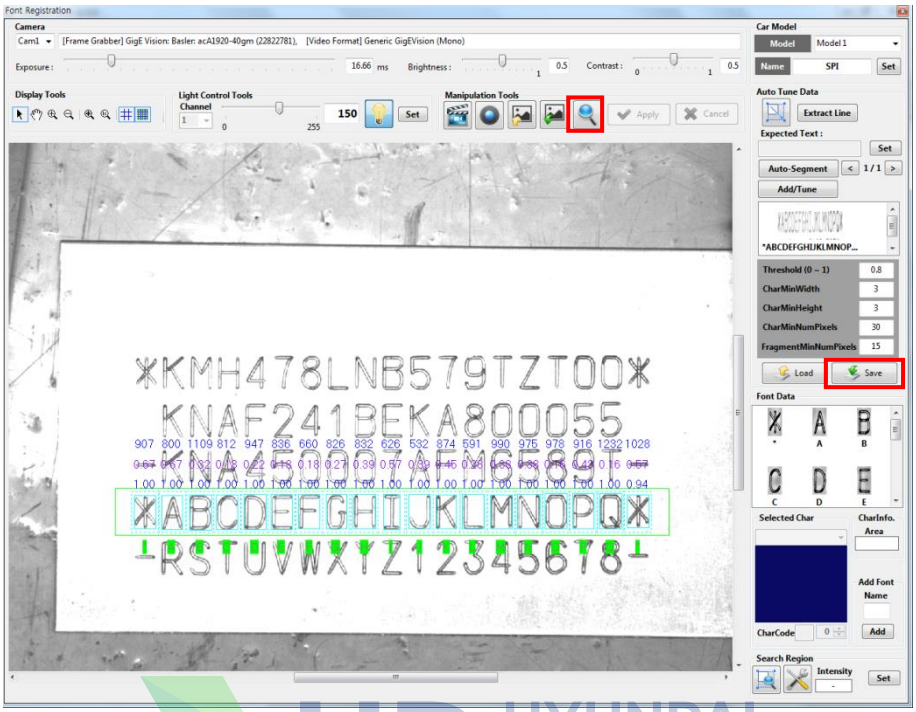
Click the [Change Search Region] button, set the search area, and click the [Apply] button.



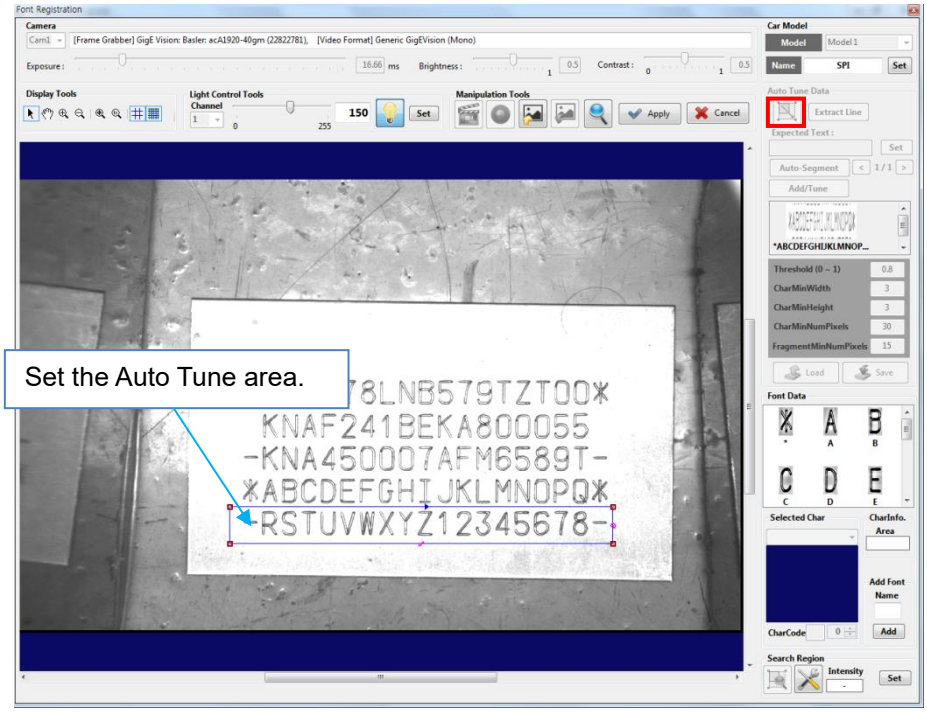
Click the [Grab] button and then the [Set] button of [Search Region] to display the average brightness value for the search area of the currently measured image.
Configure it carefully as this value will be the reference data for the auto exposure control function.

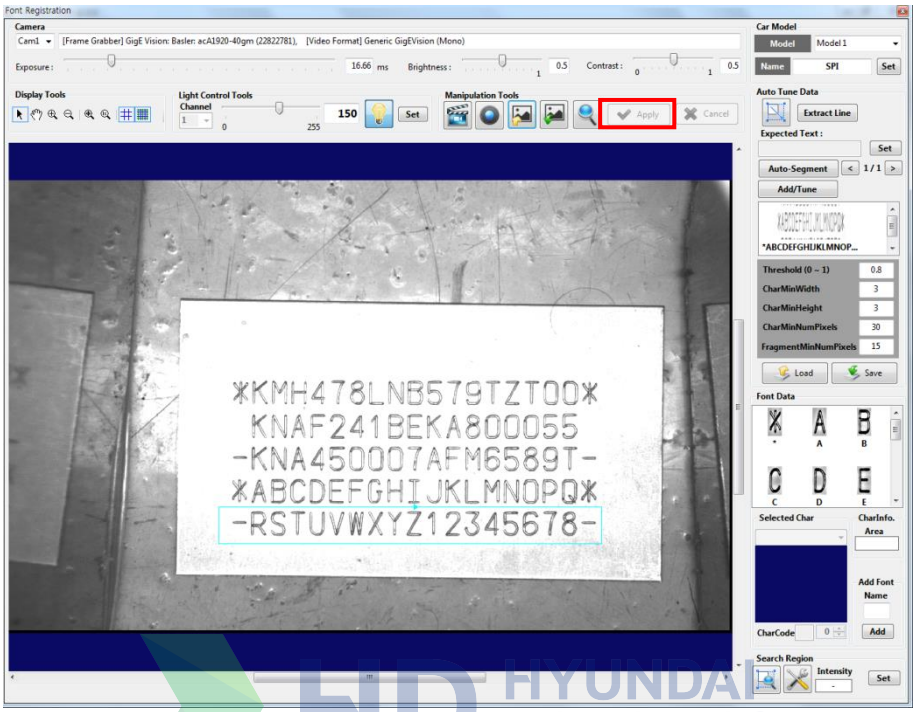


Click the [Save] button and then the [Search] button.
[Score], [Confidence], and [Area] are displayed on top of recognized characters in the configured search area.

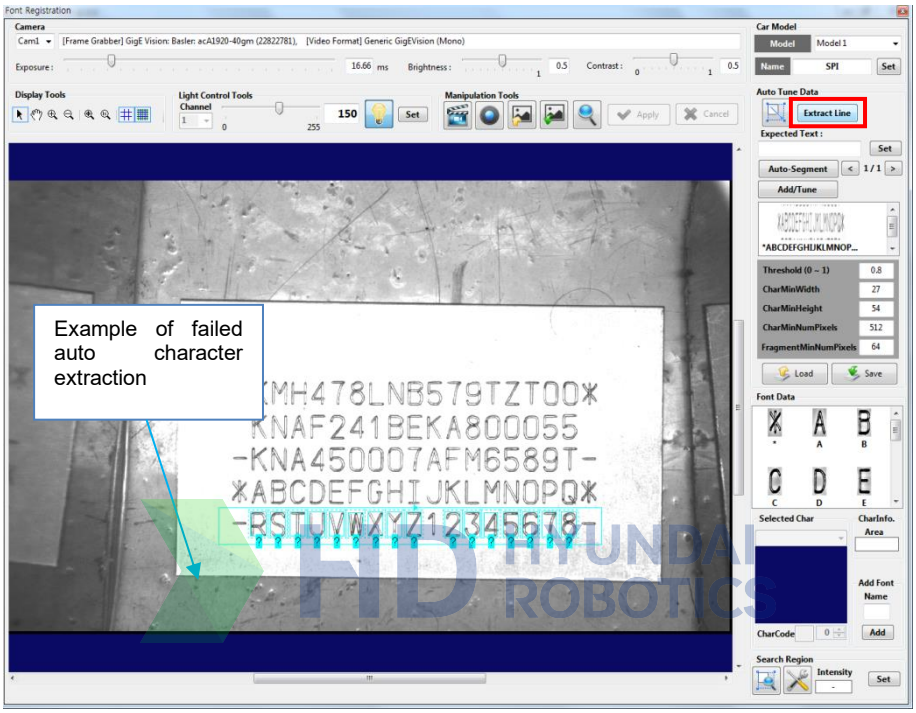


To register fonts using the Auto Tune function for other strings, proceed with the same procedure. Click the [Setup Character Region] button of Auto Tune Data. Position the rectangle and then click the [Apply] button.

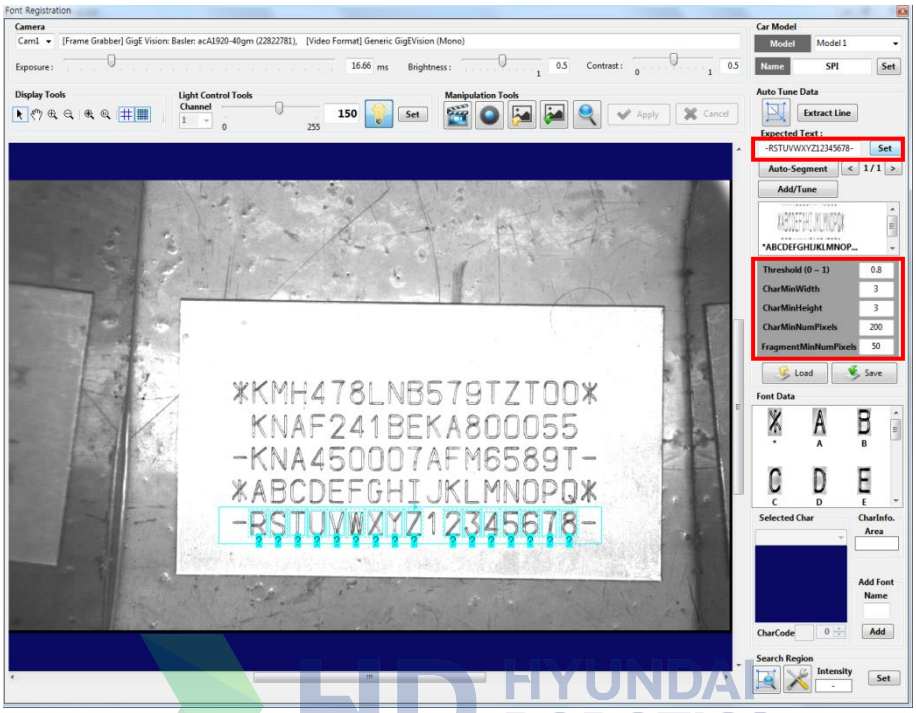




Click the [Extract Line] button to automatically extract characters in the defined area according to currently defined character recognition variables. If all characters are not recognized in the area as follows, change the OCR variables to recognize all characters. In this example, the [Char Min Width], [Char Min Height], [Char Min Num Pixels], and [Fragment Min Num Pixels] variables are changed to recognize "1" and "-."

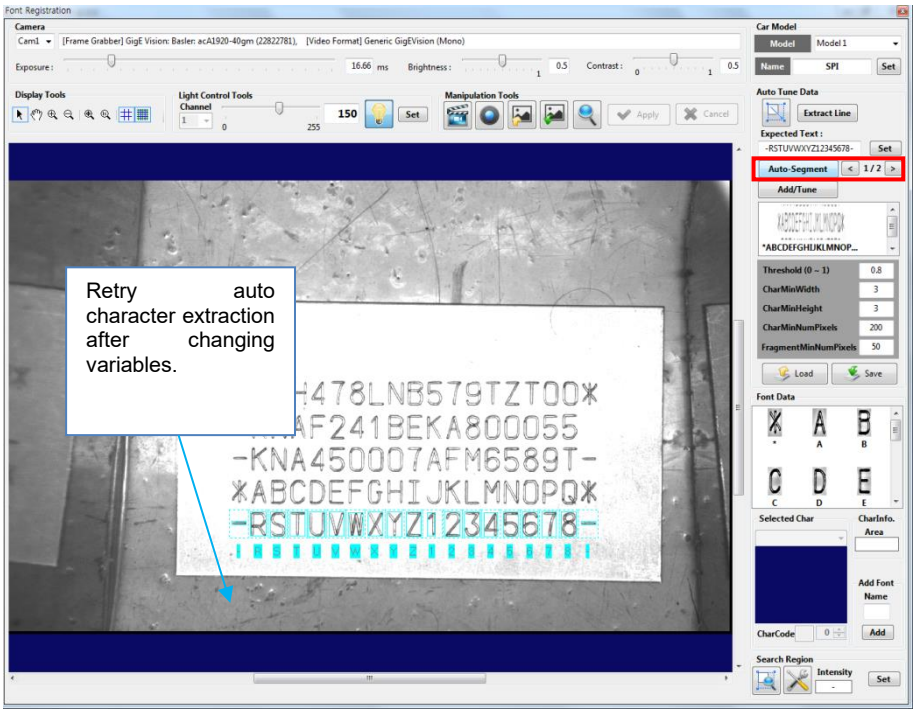


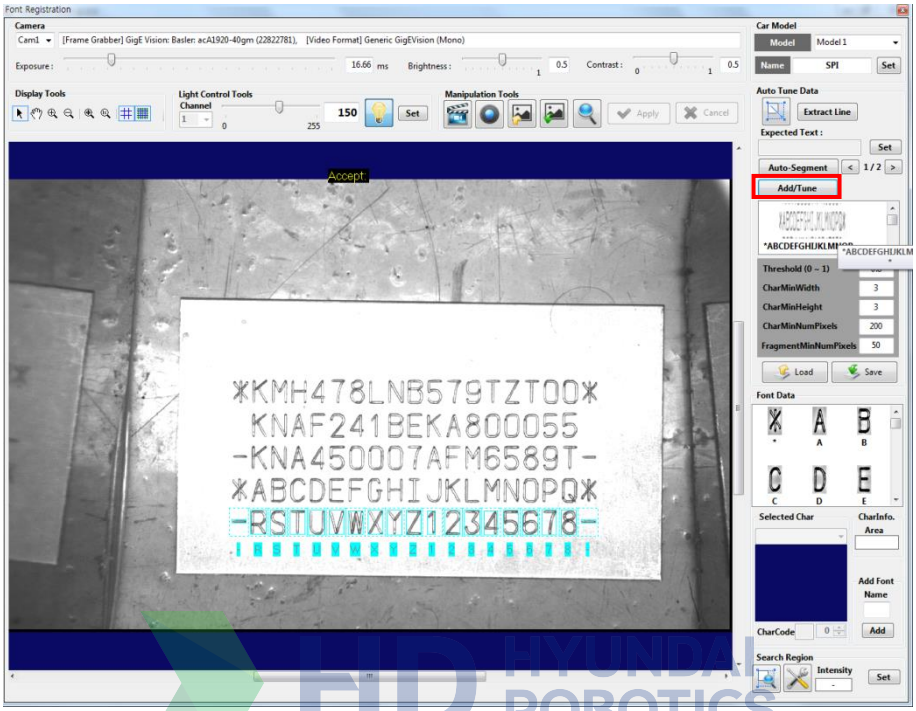
Enter letters for recognized characters into the [Expected Text] item and then click the [Set] button. Click the [Set] button to apply changed variable values.



Click the [Auto-Segment] button to display the recognized text for individually recognized characters.

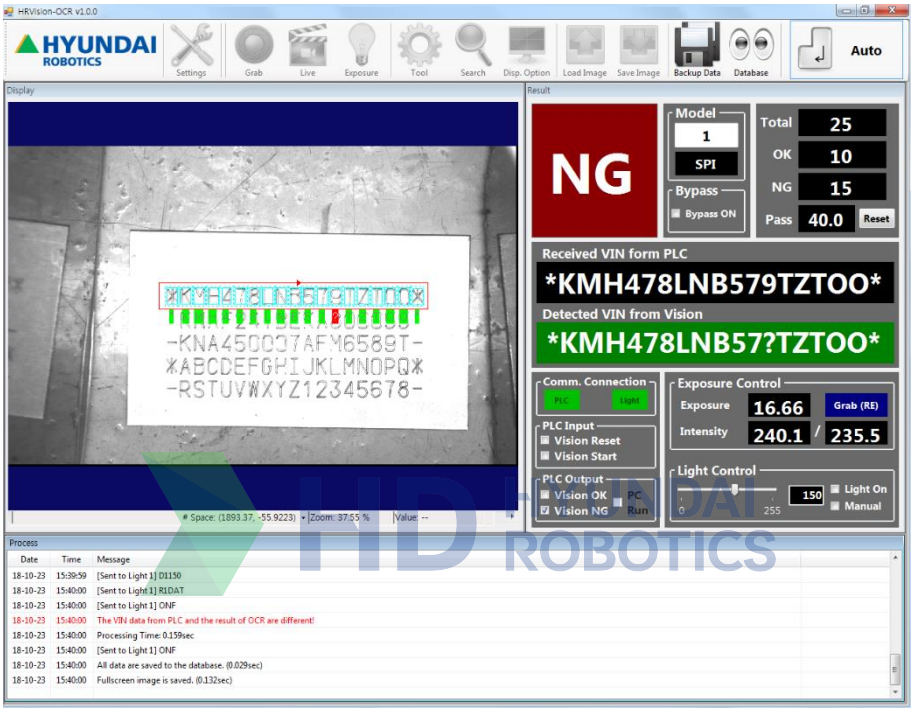
Several [Auto-Segment] results may be output as follows: Click the left/right arrow to select results within the character area, and then click the [Add/Tune] button to register fonts.



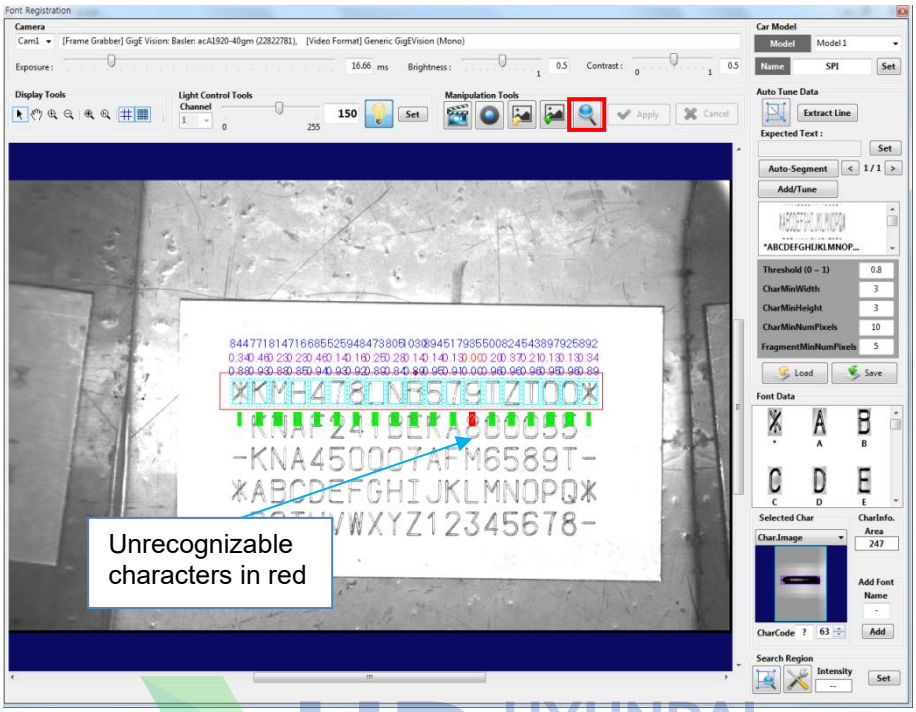

Font Registration
Camera
Car Model
Model
Model 1
Name
SPI
Set
Exposure :
16.66 ms
Brightness :
Contrast :
Display Tools
Light Control Tools
Channel
150
Manipulation Tools
Apply
Cancel
Auto Tune Data
Extract Line
Expected Text :
Auto-Segment
1 / 2
Add/Tune
Threshold (0 ~ 1)
CharMinWidth
CharMinHeight
CharMinNumPixels
FragmentMinNumPixels
Load
Save
Font Data
Selected Char
CharInfo.
Area
Add Font
Name
CharCode
Add
Search Region
Intensity
Accept
KMH478LNB579TZT00
KNAF241BEKA800055
-KNA450007AFM6589T-
ABCDEFGHIJKLMNOPQ
-RSTUVWXYZ12345678-

5.4.2. Register Individual Fonts

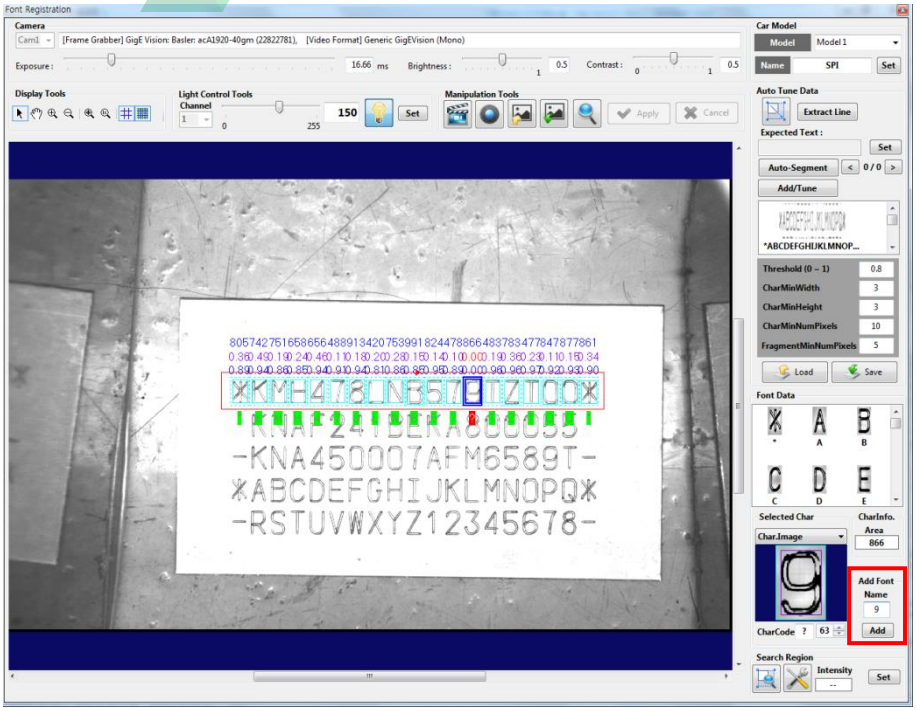
The individual font registration function registers individual characters of “failed recognition” or “incorrect recognition” without the Auto Tune function.
If character recognition is performed for characters with unregistered fonts, the following NG will occur.



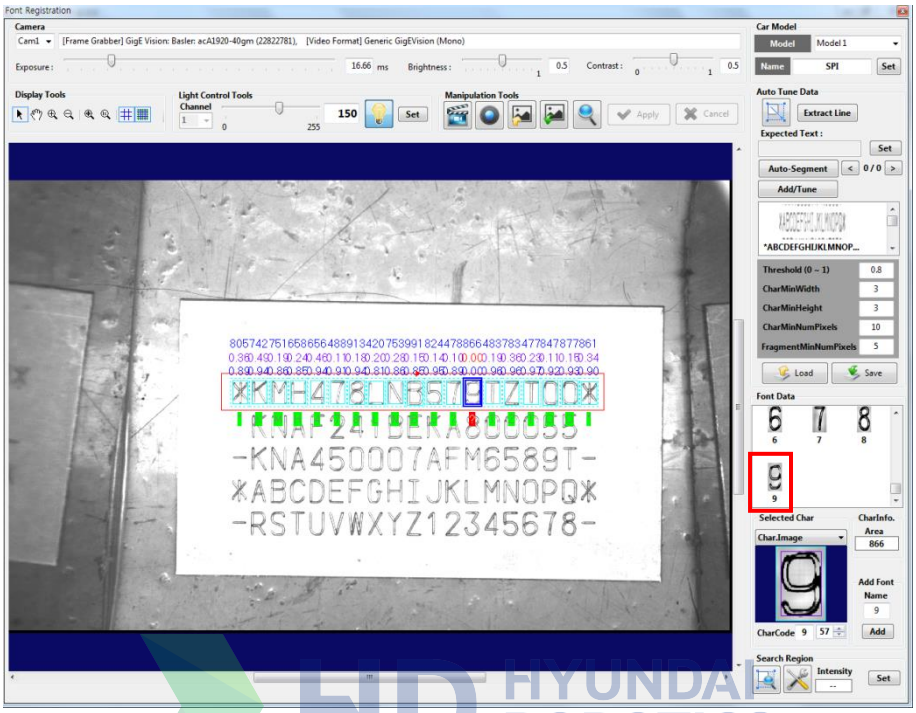
Click the [Tool] button in Manual mode to open the [Font Registration] window.
Click the [Search] button to display unregistered characters in red.



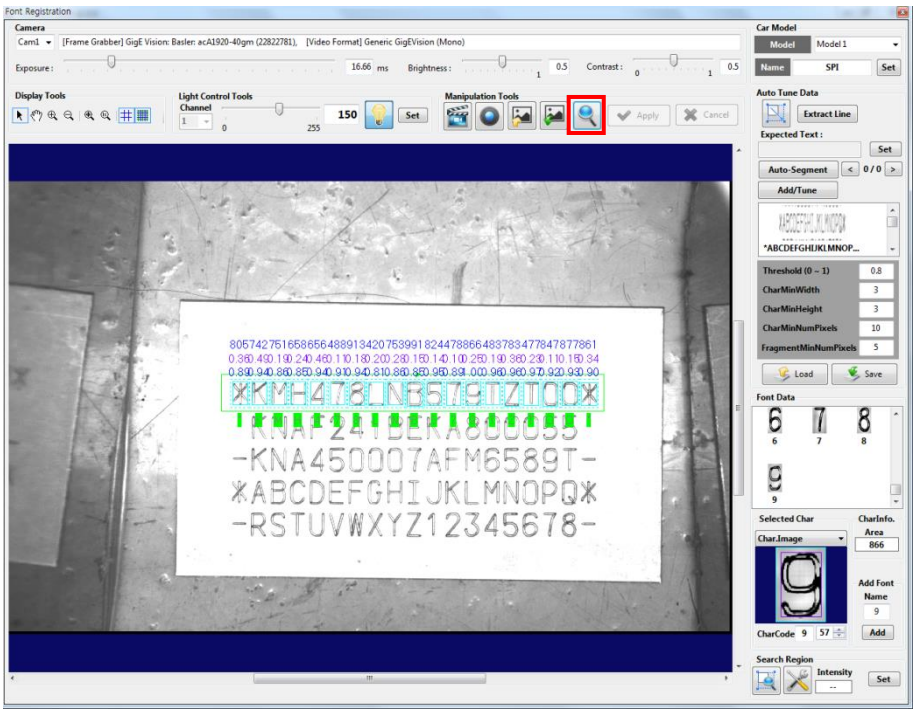
Click the unrecognizable characters, enter the corresponding text into [Add Font], and then click the [Add] button.



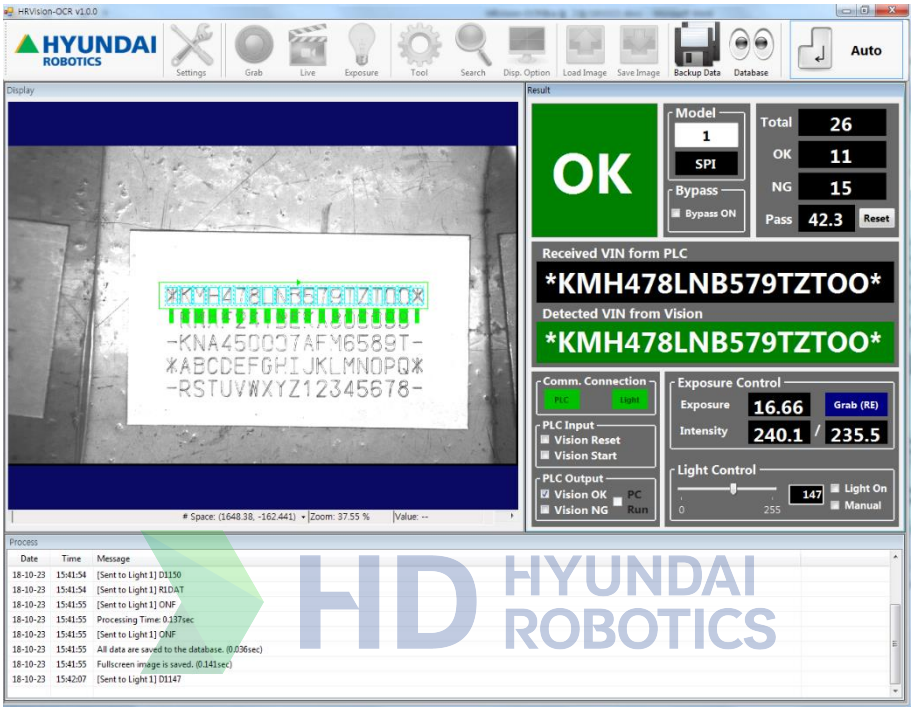
Added fonts will be displayed in [Font Data]:



Click the [Save] button and then the [Search] button to validate character recognition.



Check the auto recognition performance in connection with the PLC or robot.



5.5. External Device Connection Test

HRVision-OCR can operate automatically in connection with the Siemens PLC or Hyundai robot controller.

5.5.1. Siemens PLC Connection Test

To connect with the Siemens PLC, connect it automatically according to the Data Block configured in 5.3.2.

5.5.2. Hyundai Robot Connection Test

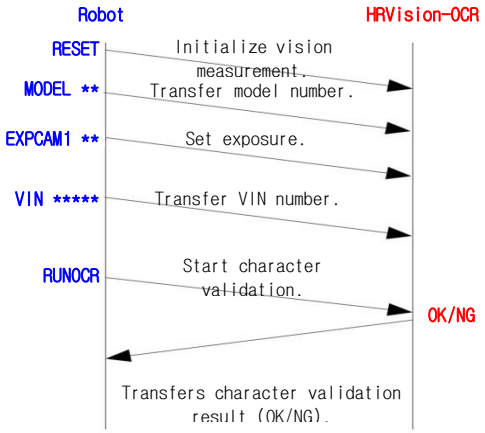
To connect with the Hyundai robot controller, create a robot JOB program as in 5.5.2.2. with reference to the communication protocol of 5.5.2.1., and then perform auto operation.

5.5.2.1. Communication Protocol

The HRVision-OCR and Hyundai robot controller exchange data through the following protocol:
Write the robot job program according to the protocol.
Communication is requested by Hyundai robots. Hyundai robots request command to HRVision-OCR as in the following table.

Command	Input data	Function	Response of HRVision-OCR
RESET	-	Vision initialization command is transferred.	All vision data is initialized.
MODEL	01–99	Model data is transferred.	Model data is saved in a variable and it waits.
EXPCAM1	Exposure	The camera exposure value is transferred.	Camera shutter speed is configured with entered exposure.
VIN	19-digit string	19-digit VIN number is transferred as a string.	VIN number string is received and displayed on the screen.
RUNOCR	-	The character recognition validation command is transferred.	Character recognition validation is performed, and the result is transferred as OK/NG to the Hyundai robot.

Here is the communication sequence between Hyundai robot and HRVision-OCR.



5.5.2.2. Robot Job Program

Here is an example of a robot job program to recognize characters using Ethernet communication.

```
'==================
 ENET1.IP="192.168.99.100" 'Vision IP
 ENET1.RPORT=2000          'Vision Port
 ENET1.LPORT=5000          'Robot Port
 ENET1.OPEN 1
 _TEINPUT=10
 CLR_RBUF ENET1 'ENET1 CLEAR
 V1$=""
 V2$=""
 '================
 PRINT ENET1,"RESET"
 DELAY 1
 PRINT ENET1,"MODEL 1"
 DELAY 0.5
 PRINT ENET1,"EXPCAM1 10"
 DELAY 0.5
 PRINT ENET1,"VIN *ABCDEFGHIJKLMNOPQ*"
 DELAY 0.5
 PRINT ENET1,"RUNOCR"
 INPUT ENET1,V1$,40,*ERROR
 V2$=LEFT$(V1$,2)
 IF V2$="OK" THEN
 GOTO *OCROK
 ELSE
 V1$=""
 GOTO *B
 ENDIF
 *OCROK
 PRINT #0,"OK"
 END
 *B
 PRINT #0,"NG"
 V1$=""
 V2$=""
 END
 *ERROR
 PRINT #0,"ERROR"
 V1$=""
 V2$=""
 END
```

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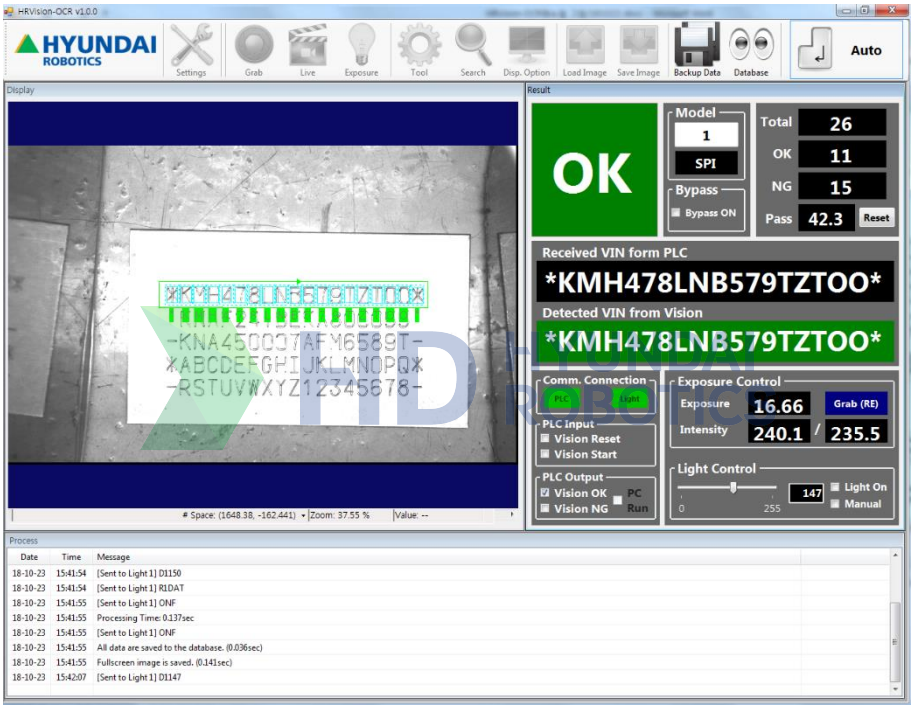
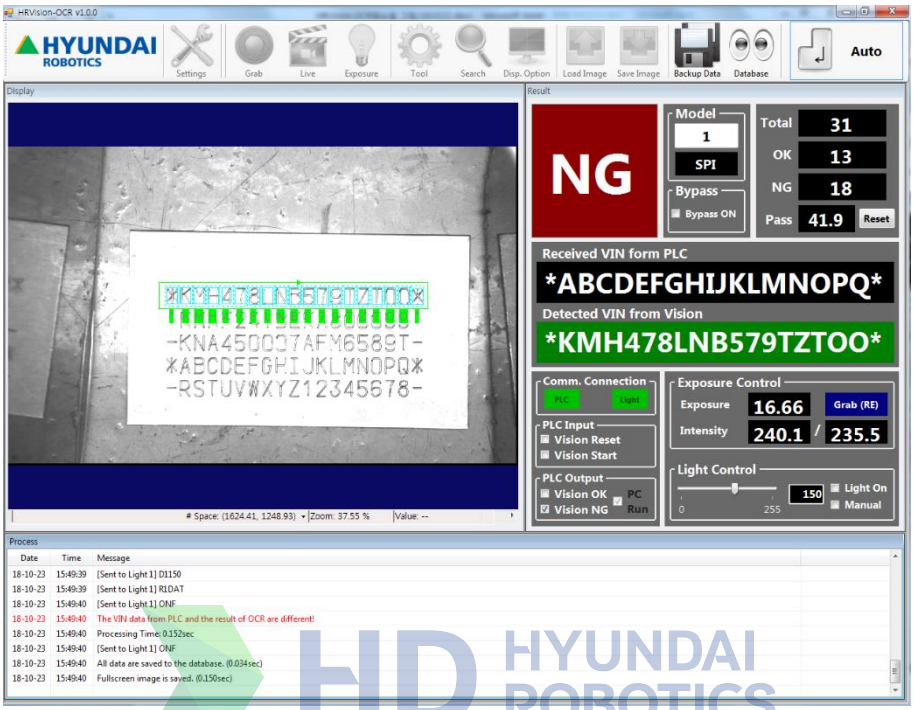
5.6. Auto Operation

Once all settings are completed, set HRVision-OCR to auto mode.
Click the [Manual] button of the control button. At the moment, the [Manual] button is switched to the [Auto] button while the other buttons are disabled.
HRVision-OCR can only be operated with the communication with the PLC or Hyundai robot.

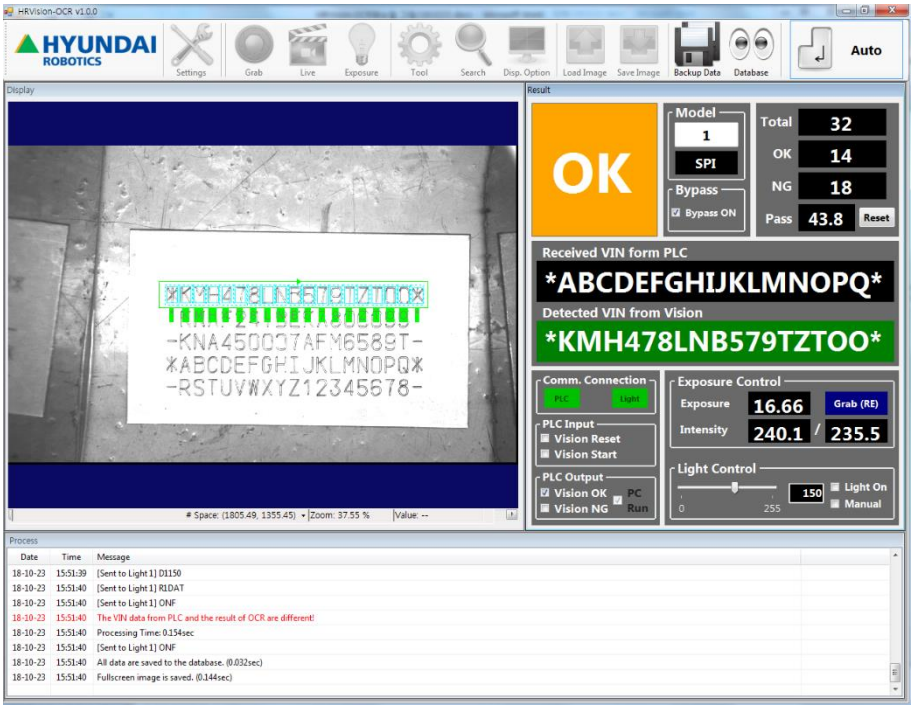
The following is the operation screen of auto operation when the character recognition result is OK.



The following is the operation screen of auto operation when the character recognition result is NG:



The following is the operation screen of auto operation in Bypass Mode.



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