TOUCH TFT MODULE

“Command Controlled Type”

APPLICATION NOTE

APN800	Initial Issue (R1.30)	October 19, 2017
	R1.40	June 05, 2018
	R1.50	June 15, 2018
	R1.60	December 25, 2018
	R1.70	April 1, 2019
	R1.80	August 2, 2019

Noritake command controlled TFT modules are comprised of a TFT Liquid Crystal Display (LCD), controller CPU, and touch panel; operated with firmware installed in the module. This is a technical support document to help use Noritake command controlled TFTmodules.

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1 INDEX

2 Preface

This document must be used in conjunction with the hardware specification（s-gt-c9xxpa-hard_jxx.pdf）and software specification (s-gt-c9xxpa-soft_exx.pdf) and it references the exact command names listed in the specification.

This application note covers the following products:

- GT480X272A-C903PA : 4.3 inch
- GTWV050C3A00PA : 5 inch
- GT800X480A-C903PA GTWV070CA01PA : 7 inch

For the information on the latest product line-up, please visit to our website or contact our sales office.
https:/www.noritake-itron.jp/

3 Scope

A Noritake command controlled TFT module is an easy to use full-color LCD subsystem equipped with a touch panel and display controller developed with expertise accumulated in VFD module manufacturing. The LCD and touch panel are operated with controllers mounted on the module and thereby can be easily controlled by any host system. Additionally, this display can become a stand-alone module by using the built-in scripting language and saving scripts to the module's flash memory to run automatically. The in-system font table includes ASCII, S-JIS, Chinese, and Korean characters.
Photo.1 is an image of a Noritake command controlled TFT module.

PHOTO.1 GT800X480A-C903PA

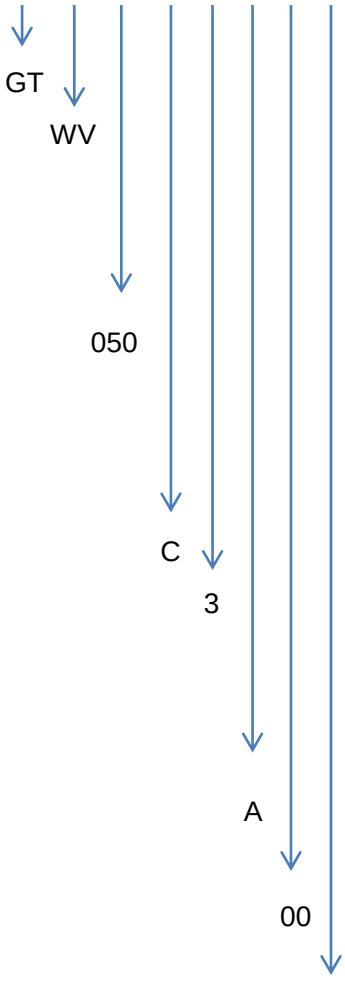
A Noritake command controlled TFT module has built-in character fonts with firmware and can be used as a character display module.

4 GT Series Module Line up

4.1 Part Number

Part number identifies product type.

Example: GT WV 050 C 3 A 00 PA



GT : Touch TFT Module

WV : Number of pixels
- WQ=480X272 pixels
- WV=800X480 pixels
- WX=1280X800 pixels

050 : Display size
- 050=5 inches
- 070=7 inches

C : Command Controlled Type

3 : Interface
- 0 = with Parallel
- 3 = Serial

A : Specification identification

00 : Revision

PA : Touch Panel
- PA=Metalized projected capacitive touch

Command and main specifications are the same among Noritake command controlled TFT modules. The above identifies general features of Noritake command controlled TFT products. Detailed product information is presented on the specification of each product part number.

Part number identifies product type.

Example: GT800x480A-C903PA

GT : Touch TFT Module

800X480 : 800X480 pixels

A : Pixel Height ~1.19mm/pixel

A = 0.1~0.19mm

B = 0.2~0.29mm

C = 0.3~0.39mm

D = 0.4~0.49mm

E = 0.5~0.59mm

F = 0.6~0.69mm

G = 0.7~0.79mm

J = 1.0~1.19mm

-C903PA：Command Controlled Type

Letters following C identify specification below:

C0xxxr = 8Bit character code only

C9xxxr = 8Bit &16Bit code character

（JIS Kanji, Chinese, Korean characters）

Cxx0xr = RS232C and parallel interface

Cxx1xr = USB interface

Cxx2xr = C-MOS serial and parallel interface

Cxx3xr = C-MOS serial interface

CxxxPr = Capacitive touch panel

CxxxxA = Products revision　none, “A”, “B”, ...

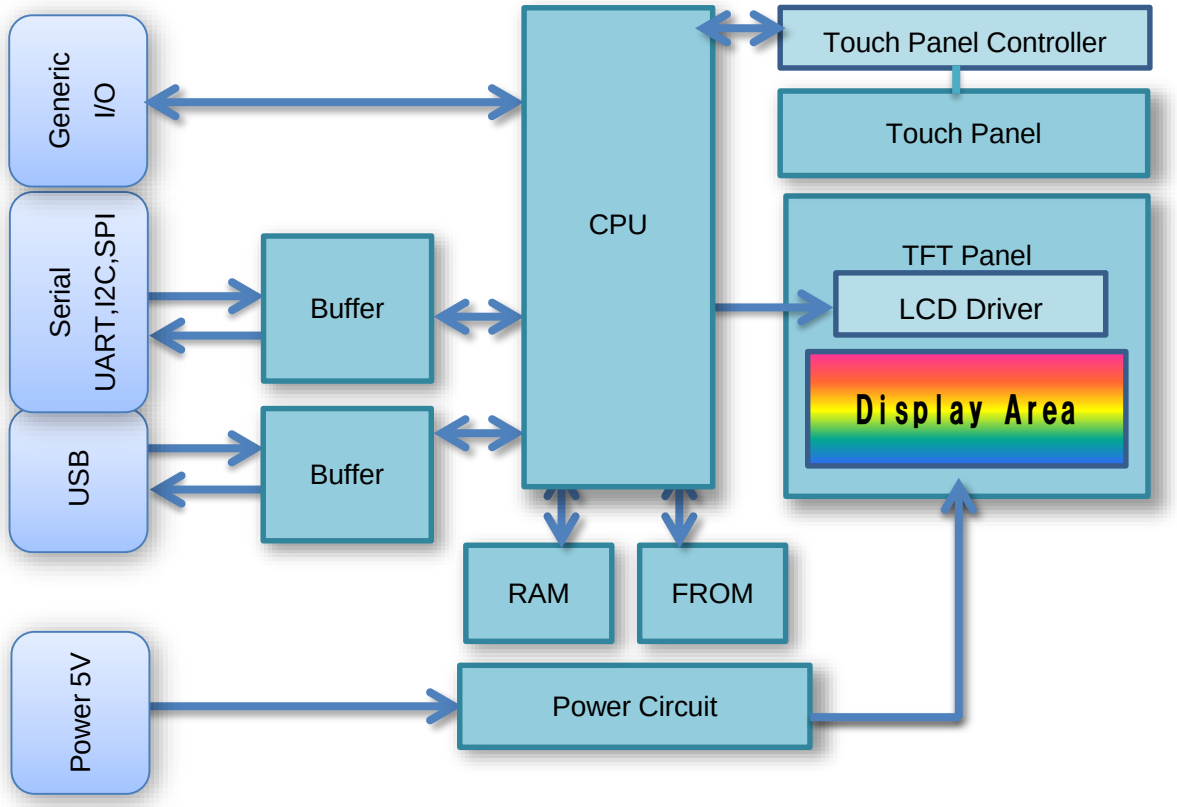
Command and main specifications are the same among Noritake command controlled TFT modules. The above identifies general features of Noritake command controlled module TFT products. Detailed product information is presented on the specification of each product part number.

5 Hardware

5.1 Block Diagram

The display module is comprised of a FLETAS touch panel, signal input/output unit, CPU (Control Circuit), power circuit, and TFT-LCD.

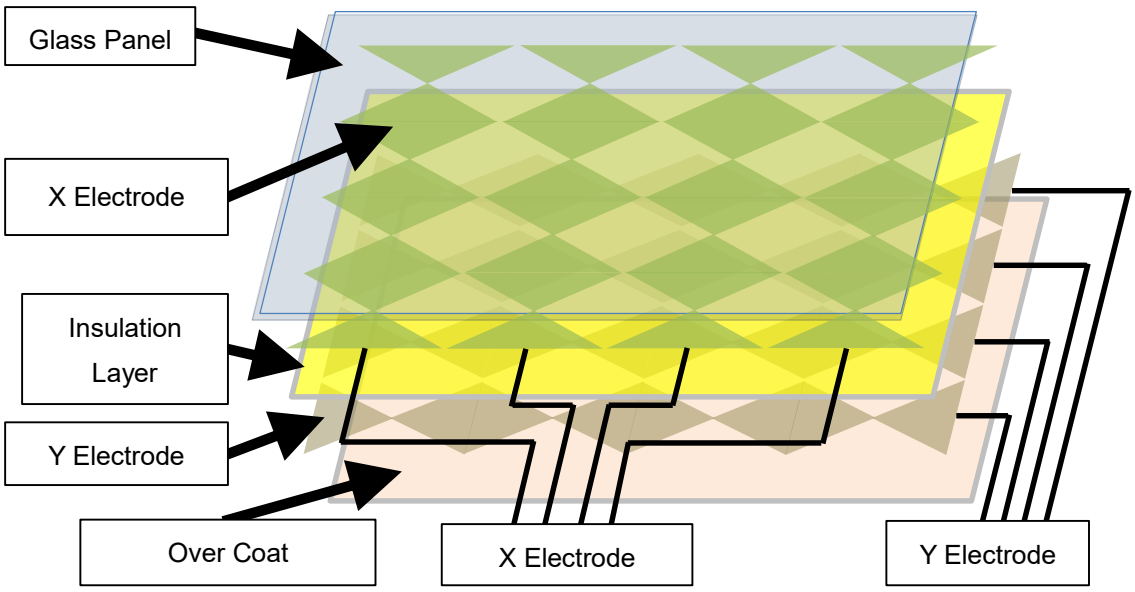
5.1.1 Block Diagram (GT-C903PA)



5.2 Capacitive Type Touch Panel (FLETAS)

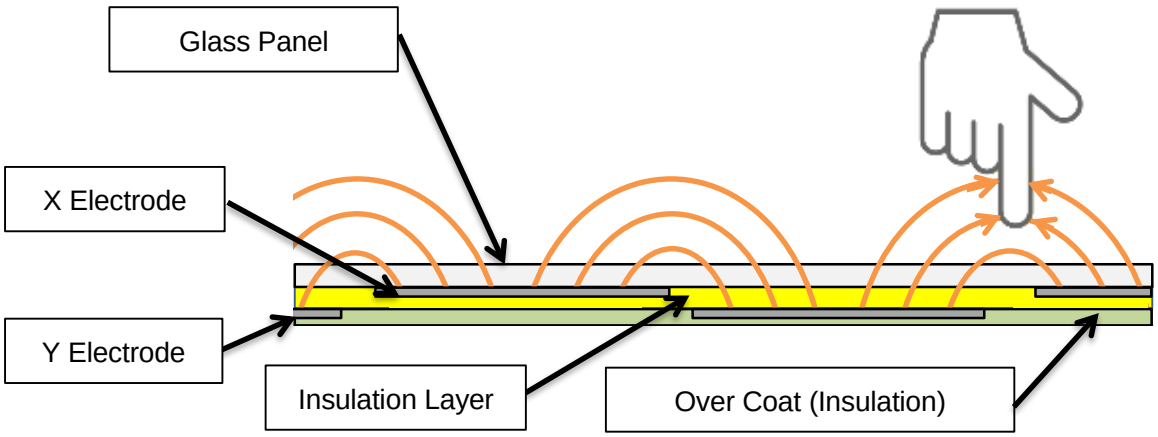
Touch TFT Module has a projected capacitive type touch panel.

It has a structure where X and Y electrodes are created by an aluminum thin film technique through an insulation layer on one glass substrate. The aluminum thin film electrodes utilize thin film processing technology and expertise accumulated through VFD manufacturing. The thin film aluminum electrodes contribute to lower impedance and a higher light transmission ratio compared to ITO.

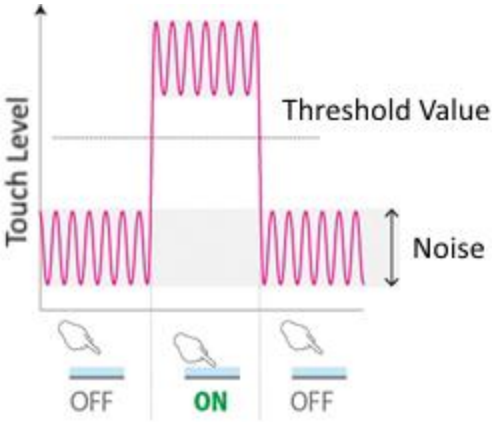


5.2.1 Principle

An electric field is generated by applying voltage between the X and Y directional electrodes. The controller detects electric fields fluctuation caused by approaching conductive materials such as a finger. Voltage is applied using progressive scanning so multiple touch points can be individually detected. Consequently, multi-touch functionality is available on the FLETAS touch panel.



5.2.2 Touch Adjustment Basics



When a finger is placed on the touch panel, the electric field changes. When the touch level change exceeds the threshold value, a touch is recognized.
The touch level increases as the distance between the finger and touch panel decreases. However, when gloves, an overlay, or air gap are used, the distance between the finger and touch panel increases. As the distance between the finger and the touch panel increases, the touch level decreases. The overlay material also affects the touch level. Touch level will be higher with glass; acrylic and polycarbonate will make it lower.
The lower the threshold value, the more sensitive the touch panel is. However, this increases the risk of errors due to external noise. Since the touch level is influenced by incoming noise, if the threshold value is too low, this noise may cause errors. It is important to adjust the threshold value so there is a satisfactory sense of touch and ample amount of noise immunity.

Influence of touch level by structure

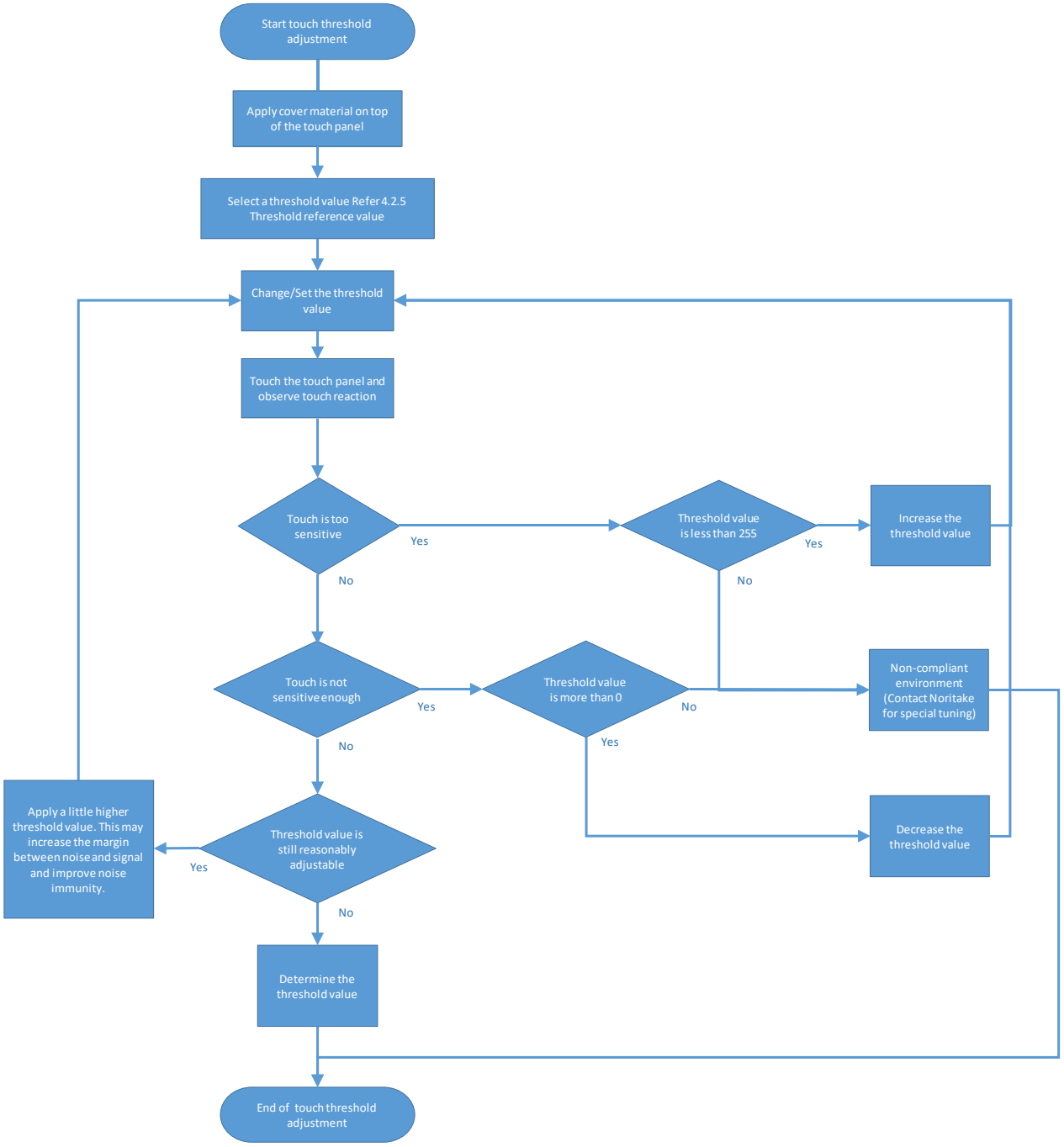
Touch level	High	Low
Cover material	Glass	Acrylic, Polycarbonate
Cover thickness	Thin	Thick
Air gap	Narrow	Wide
Touch finger	Bare hands/Thin gloves	Thick gloves

Influence of upper and lower threshold values

Threshold	Decrease	Increase
Touch feeling	Light touch feeling	Insensitive touch feeling
Gloves	Even thick gloves are easy to react	No reaction with thick gloves
Noise tolerance	Very likely to malfunction	Not likely to malfunction

5.2.3 Capacitive Touch Panel Parameter Adjustment

To adjust and set the touch sensitivity, refer to the flow chart below:



5.2.4 Setting the Threshold Value

Setting Method 1

Set the threshold value with "Touch parameter setting" command in the equipment's initialization sequence. The threshold value will be effective until the equipment is reset.

Setting Method 2

By registering the threshold value in its memory switch, the module will retrieve this new value after the module is reset. Register the threshold value in the MSW 59 with the "Memory Switch setting" command or support tool.

5.2.5 Threshold Reference Value List

Threshold value by overlay material and thickness

Test condition: Level when lightly touched with an index finger

Threshold Reference Setting Table (for acrylic)

Overlay Thickness(mm)		3		5	
Air Gap(mm)		0.3	1	0.3	1
GT480X272A-C903PA F1.25～ *1	Threshold	26h	1Ah	17h	14h
	Single Touch	○	○	○	○
	Multi Touch	○	*2	*2	*2
GTWV050C3A00PA F1.30～ *1	Threshold	TBD	TBD	17h	14h
	Single Touch	○	○	○	○
	Multi Touch	○	*2	*2	*2
GT800X480A-C903PA F1.20～ *1	Threshold	2Ah	1Eh	1Ah	15h
	Single Touch	○	○	○	○
	Multi Touch	○	○	○	○

- : Not recommended ○: No problem

*1: Fx.xx represents firmware version x.xx or later.

*2: If the fingers are close together, the touch order may change

Threshold Reference Setting Table (for glass)

Overlay Thickness(mm)		1.3			3.2			5		
Air Gap(mm)		0.3	1	3	0.3	1	3	0.3	1	3
GT480X272A-C903PA F1.25～ *1	Threshold	5Ch	30h	12h	3Ch	20h	0Eh	29h	18h	-
	Single Touch	○	○	○	○	○	○	○	○	—
	Multi Touch	○	○	*2	○	○	*2	○	*2	—
GTWV050C3A00PA F1.30～ *1	Threshold	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
	Single Touch	○	○	○	○	○	○	○	○	○
	Multi Touch	○	○	○	○	○	○	○	○	○
GT800X480A-C903PA F1.20～ *1	Threshold	64h	38h	14h	44h	29h	11h	31h	21h	0Eh
	Single Touch	○	○	○	○	○	○	○	○	○
	Multi Touch	○	○	○	○	○	○	○	○	○

- : Not recommended ○: No problem

*1: Fx.xx represents firmware version x.xx or later.

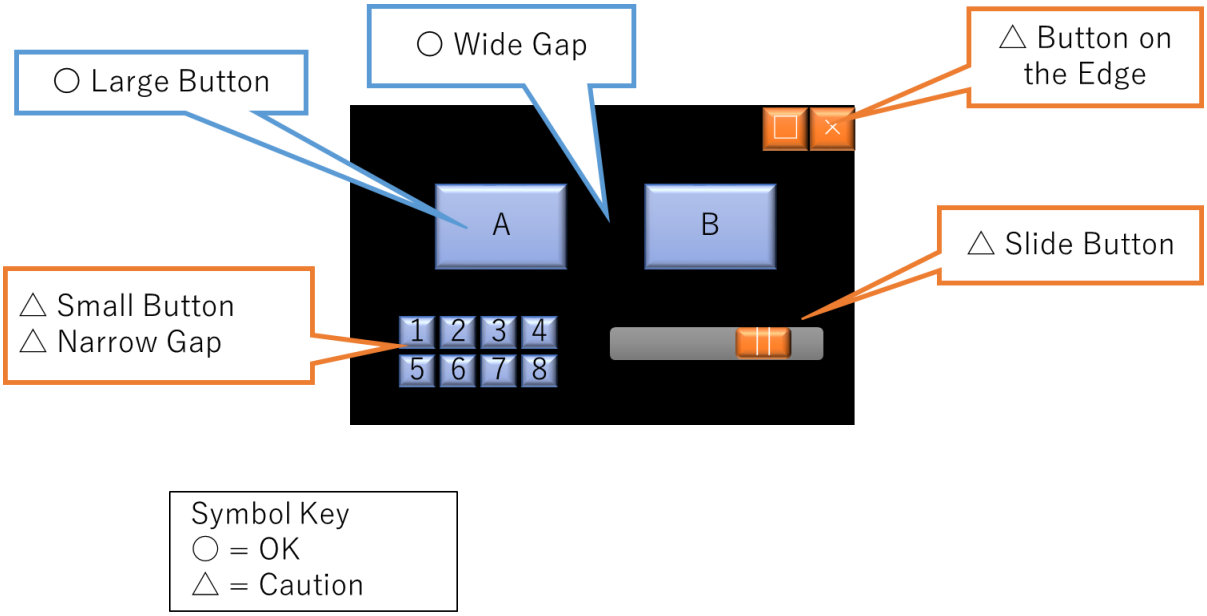
*2: If the fingers are close together, the touch order may change

5.2.6 About Water on the Touch Panel

Touch operation is possible even when the touch panel is wet with water. Operation reliability is greatly affected by the water conductivity, the amount of water drop sitting on the touch panel, and how the water is applied to the touch panel. If the conductivity is high and the amount of moisture remaining on the touch panel is large, touch may act erroneously (it may react at coordinates different from the touched coordinates). When operating in a wet environment, it is important to obtain a high touch level, set a high threshold value, and make the moisture less likely to stay on the touch panel. Please consider the following design points:

- Use a glass overlay.
- Use a thin overlay and air gap.
- Set the threshold value higher.
- Touch with bare hands or a very thin glove.
- Install the touch panel vertically so that water does not stay on the panel.
- Apply a water repellent coat to the cover material so that the water film does not stretch on the panel.
- Do not use metal (conductive material) for housing (especially the periphery of the touch panel).
- Do not allow water to come in contact with the touch panel and physical ground at the same time.
- Reduce the maximum number of touches. (use single touch if possible)
- UI only uses buttons, avoid slide or swipe.
- Keep distance between buttons.
- Use large buttons.
- Do not place a button on the edge of the screen.

UI Example:



5.2.7 Incorrect touch suppression (Firmware No. : F1.20 or later)

In order to prevent runaway due to abnormal touch, the following function to suppress erroneous touch is installed. If individual touch panel tuning is required to adjust the effect and/or cancel the suppression function. Please contact us.

Palm touch control

If touch input covers a large area, such as a touch with the palm or a touch with a large amount of water, the area will be seen as abnormal and touch will be disabled. In order for this corrective action to work properly, a proper threshold value must be set. Otherwise, touch may be disabled/enabled unintentionally.

Continuous touch suppression

If the touch input has not moved for about 10 seconds, the touch input is deemed abnormal due to foreign matter and the touched area will be disabled.

5.2.8 Touch Setting Package (Firmware No. : F1.20 or later)

Touch setting package data contains parameters for detailed touch behavior control. By storing and selecting this data, you can make it behave differently from the default touch parameters. Four packages can be stored in addition to the factory default settings. Please consult us for package data provisions.

Package Storage

Specify the storage location of package data with the "Touch Setting Package Data Store" command or support tool, and then store the package data into the module's dedicated flash memory.

Package Selection Method 1

In the initialization sequence (immediately after turning on the device), select the package to use with the "touch setting package selection" command. The selected package will modify the module's touch behavior. This is effective until you select another package or restart the module.

Package Selection Method 2

With the touch package memory switch, you can start with a certain touch package at power-on. Please set the desired touch setting package value to MSW 63 with the "Memory Switch Setting" command or support tool. When MSW62 is set to 01H, touch sensitivity (signal gain and threshold) values will be set to the registered values of the package selected with MSW 63 at power-on.

Please refer to the software specification for details.

5.2.9 About Individual Tuning

The default touch settings (factory setting touch setting package) is an adjustment value group intended to perform general-purpose touch behavior in a wide range of environments. Therefore, it may be necessary to individually tune touch configuration parameters for a customer's product. This kind of special tuning is required if changing the threshold values described in section 5.2.3 does not work. Please contact us for details.

6 Installation Method

6.1 Handling Precautions

- The touch panel is a glass product. Since the edges and corners are sharp, please be careful during handling and assembly. If a strong shock or stress point is applied to the panel, it may cause damage. The broken glass is extremely sharp. Please treat the glass with care and wear leather gloves for protection.
- Please do not touch the FPCs. Also, please do not install the panel in a way that introduces stress on the FPCs.
- This product is comprised of precision electronic parts. Please handle carefully. When holding this product, please grab onto the PCB edges and do not touch the touch panel. Also, please follow static electricity handling precautions.

7 Connector

A Noritake command controlled TFT module is equipped with USB-Micro connector. The power, serial interface and GPIO connectors are not mounted on this series. A pin header needs to be soldered onto the desired interface port to use the serial or GPIO interface.

Reflow soldering and wave soldering cannot be used on Noritake command controlled TFT modules.

7.1 Host Interface, GPIO

The signal level specification is 3.3V. Applying 5V signals may cause damage to the display module.

Interfaces in the table below are included on the indicated module. Jumper settings require soldering. Default setting is SPI serial interface (J5 and J6 open).

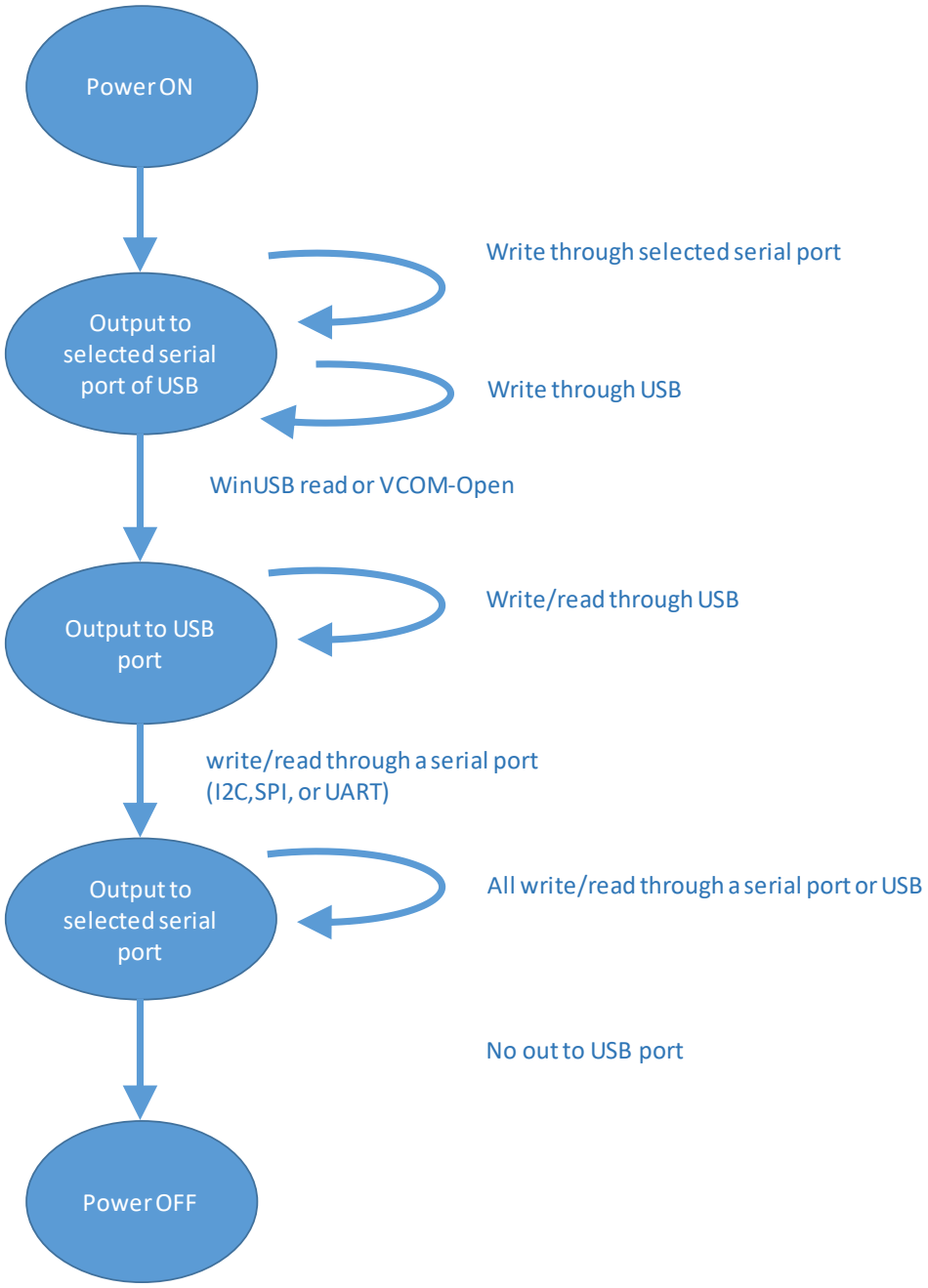
Table: Host Interface and General Purpose I/O

	GT480X272A-C903PA **GT800X480A-C903PA** **GTWV050C3A00PA**	**GTWV070C3A01PA**
Parallel Interface 5V/C-MOS	Not equipped	Not equipped
Asynchronous Serial Interface C-MOS (3.3V) *1	Equipped	Not equipped
Asynchronous Serial Interface RS-232C	Not equipped	Equipped
Synchronous Serial Interface I2C (3.3V) *1	Equipped	Not equipped
Synchronous Serial Interface SPI (3.3V) *1	Equipped	Not equipped
USB Device High Speed/Full Speed	Equipped	Equipped
Generic I/O Port (3.3V)	26 bits (Port0 to Port3)	26 bits (Port0 to Port3)

*1: All three interfaces are sharing one connector, then only one interface can be used at one time. The interface to be used is selected by jumper setting. Jumper positions are described in the hardware specification and the software specification.

7.2 State Transition of Output Port Selection

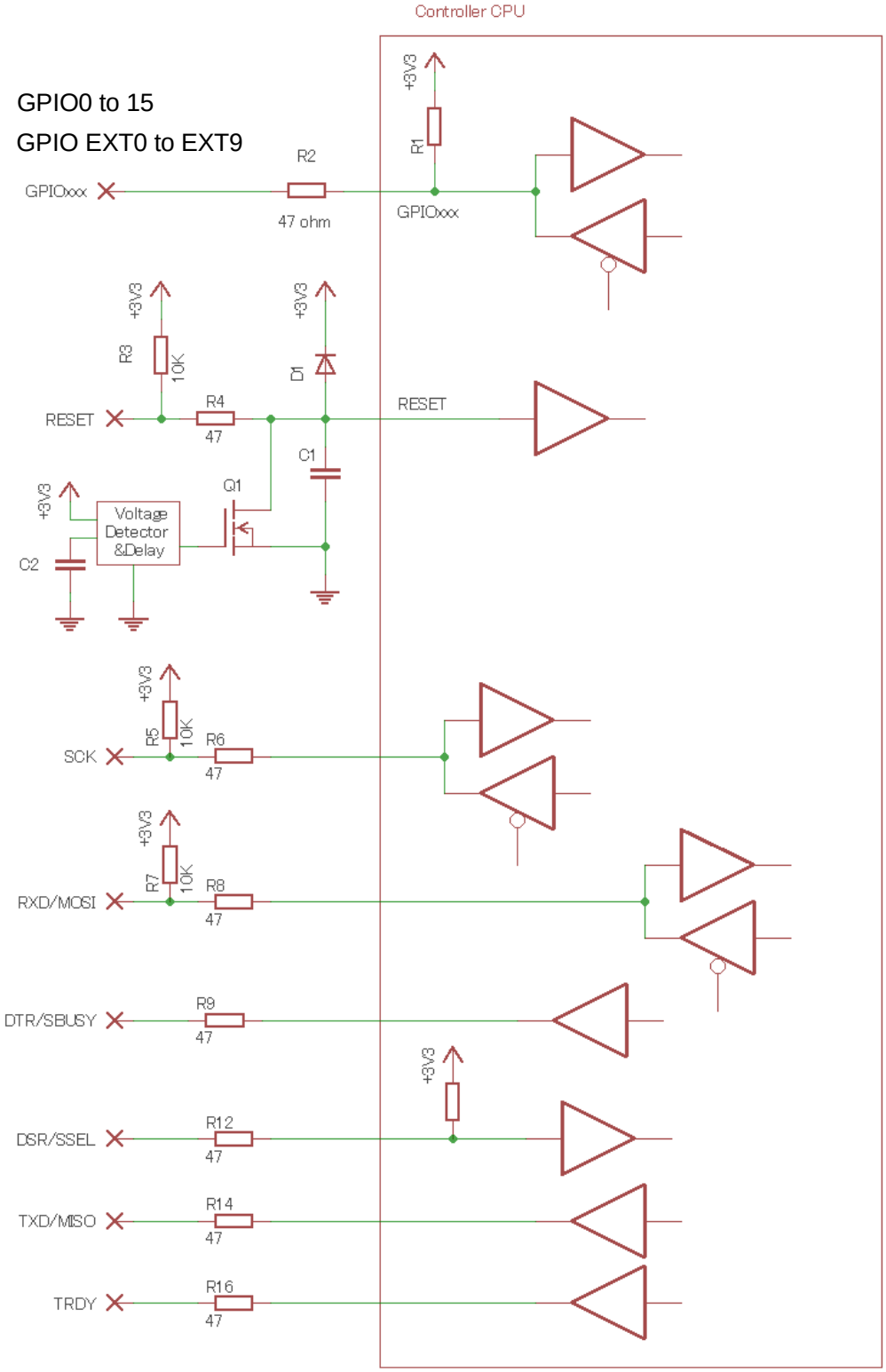
Serial Data Output State Machine



Be careful while using serial communication concurrently with USB debugging. If a serial port is used to read/write data, this data is only sent through the same serial port and not through USB. If a response is needed via USB, then the request must be sent via USB. Additionally, if a command is sent via serial communication that requires internal calculations, make sure that the USB debug interface is aware of this.

7.3 Input/Output Equivalent Circuit

7.3.1 Input/Output Circuit (GT-C9x3PA 1/1)



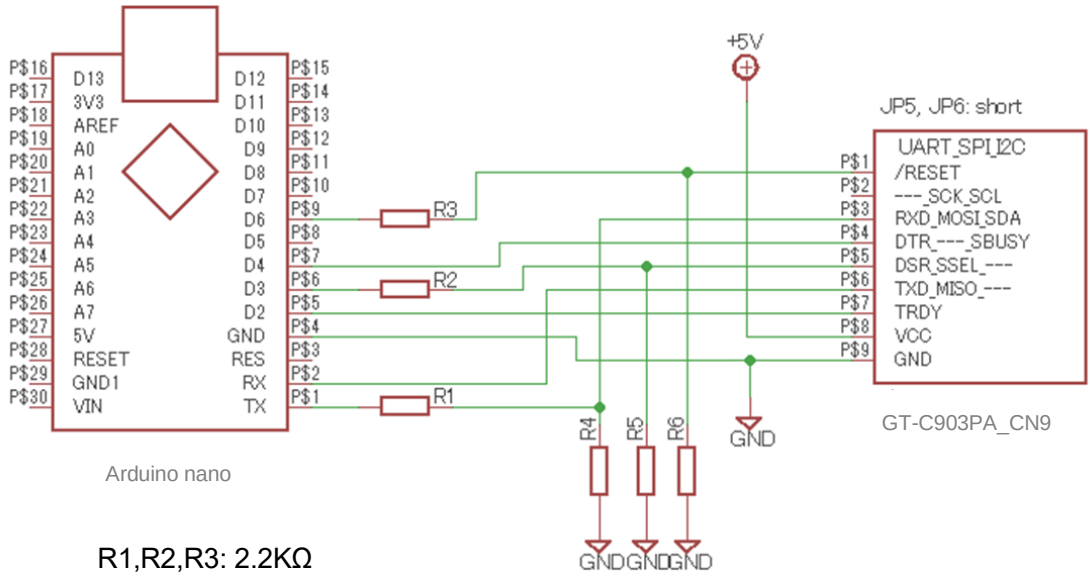
Unused Terminal Handling:

As the equivalent circuit shows, the RESET signal is pulled up internally and can be kept open. However, if a signal is left disconnected, there is a possibility that it will become an antenna and pick up noise and cause malfunction.

7.4 Connecting to a Host Controller

Setting: GT-C903PA JP5, JP6 shorted (UART, 38400BPS)

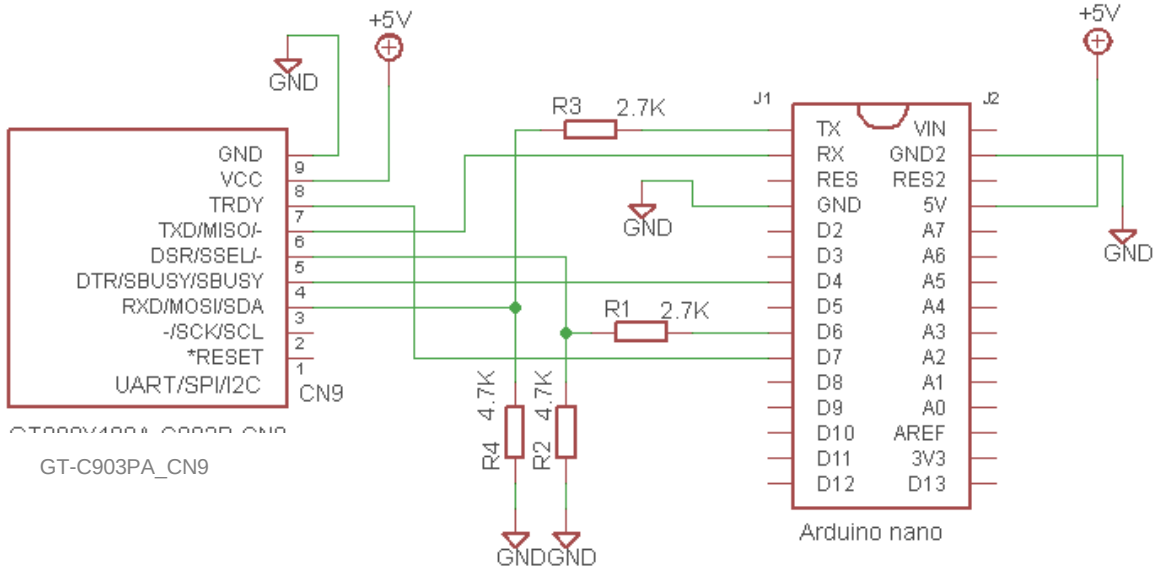
With Reset



R1,R2,R3: 2.2KΩ

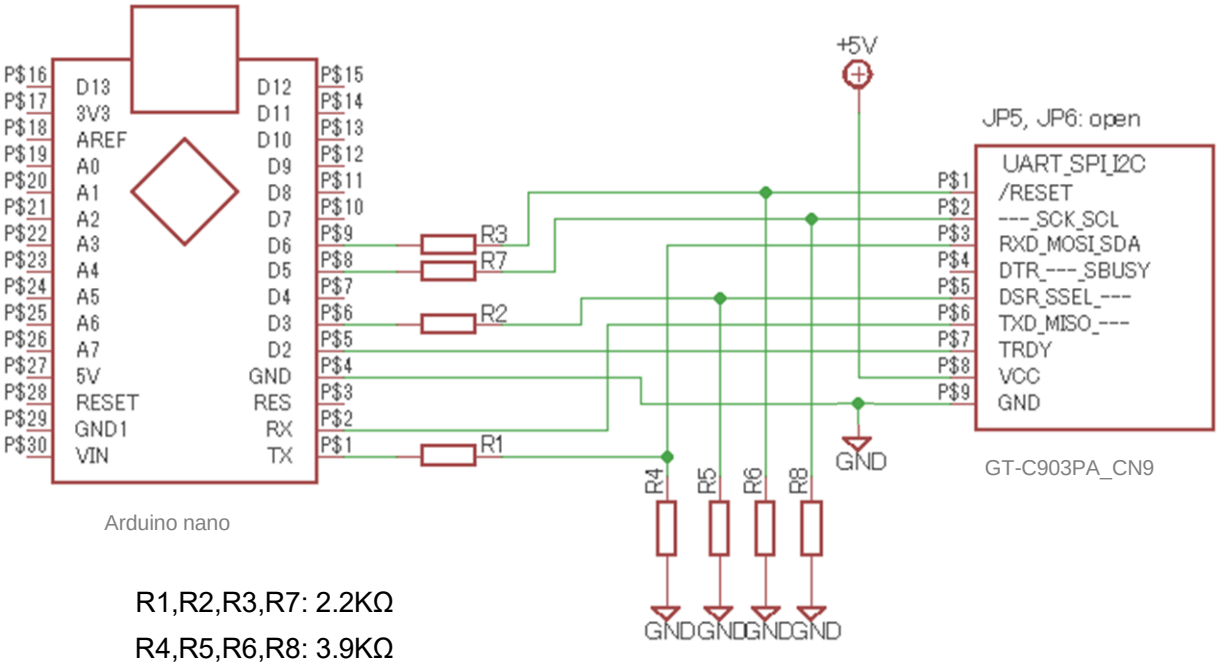
R4,R5,R6: 3.9KΩ

Without Reset



Note: When connecting with a 5V operating microcontroller, the signal level must be changed to 3.3V for the display module. The above example shows how the signal level is changed by using a voltage divider with a resistor.

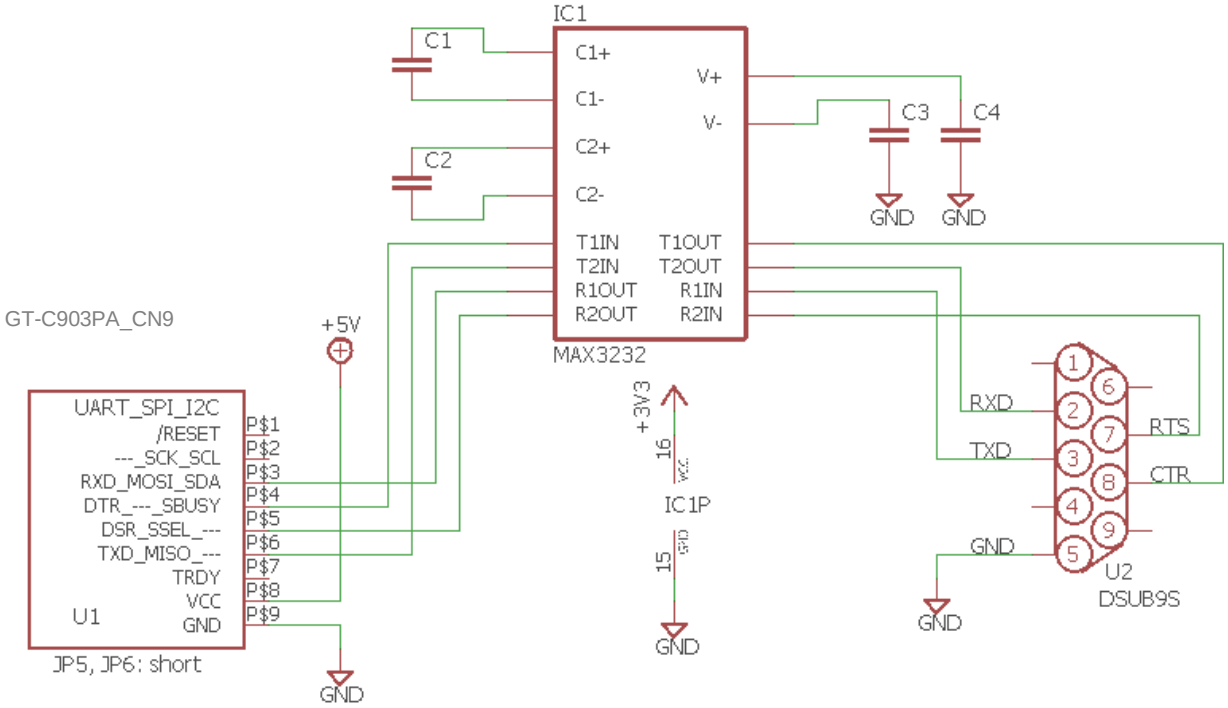
7.4.1 Example of Connection to Embedded CPU with SPI Interface



R1,R2,R3,R7: 2.2KΩ

R4,R5,R6,R8: 3.9KΩ

7.4.2 Example of Connection to Embedded CPU with RS-232C Interface



8 Software

8.1 Memory

The display module is equipped with memory accessible for the following uses.

Memory fields are divided for each use.

Name	Type	GT480X272A-C903PA	GT800X480A-C903PA GTWV050C3A00PA GTWV070C3A01PA
Display Memory	RAM	960 x 544 pixels	1600 x 960 pixels
Bit Image Definition RAM (picture image data)	RAM	4K byte	4K byte
Bit Image Definition FROM1 *2	Flash ROM	2048K byte	2048K byte
Bit Image Definition FROM2/ General-purpose FROM2	Flash ROM	257,024K byte This field is reserved area for factory programmed font. Customer's outline font can be stored any location within FROM2.	257,024K byte This field is reserved area for factory programmed font. Customer's outline font can be stored any location within FROM2.
General-purpose RAM	RAM	1,024 byte	1,024 byte
General-purpose FROM	Flash ROM	4,096 byte x 16 pages	4,096 byte x 16 pages
UDF *1 (User defined font)	RAM Flash ROM	16 letters for each font type	16 letters for each font type
FROM User Font *1	Flash ROM	128 letters for each font size	128 letters for each font size
FROM Extension Font *1	Flash FOM	64K byte	64K byte
RAM for MACRO	RAM	1024 byte	1024 byte
FROM for MACRO	Flash ROM	8K byte x 4 pages	8K byte x 4 pages

Note: 1K byte = 1024 bits

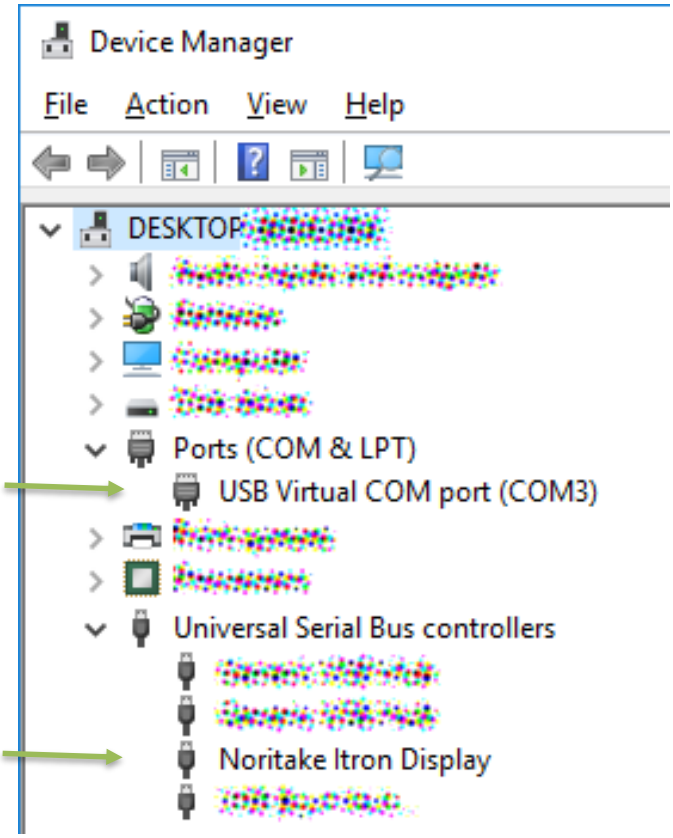
*1: Dot font applies to UDF, FROM user characters, and FROM extension fonts.
Outline font (otf, ttf) is stored in FROM 2.

*2: The first 2048K bytes of FROM1 and FROM2 share the same memory.

8.2 USB Driver

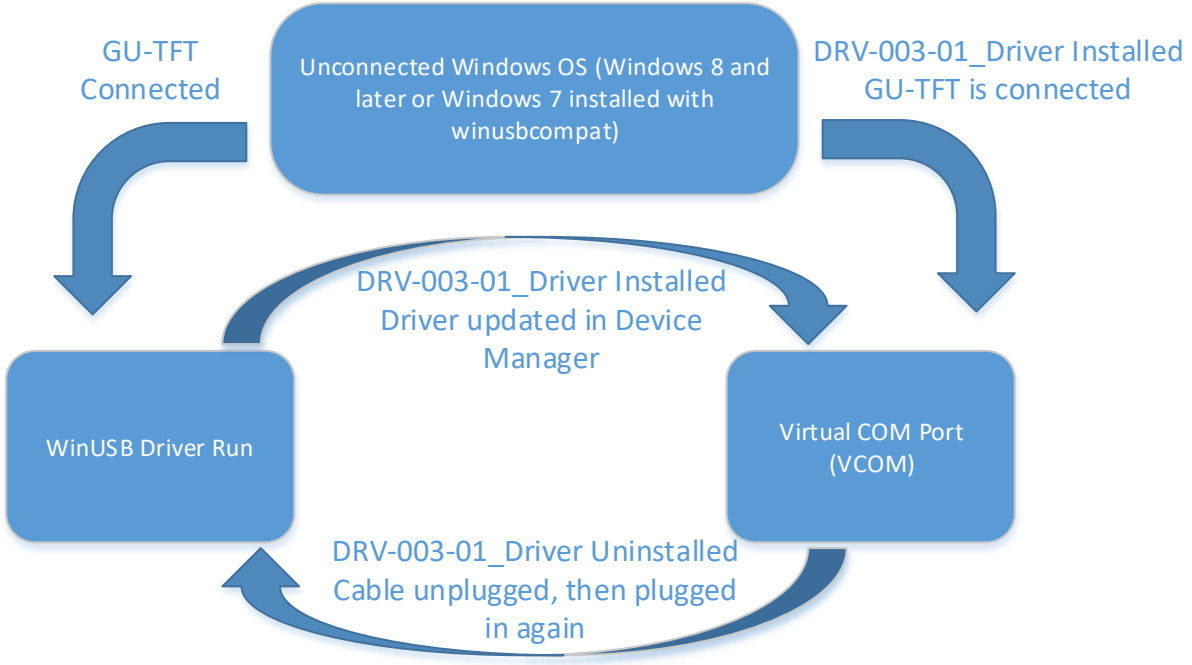
8.2.1 Driver supported by Windows

Microsoft Windows supports 2 types of drivers for USB interfacing.
One is WinUSB, which is a recognized universal serial interface. This driver is loaded and unloaded automatically when the USB cable is plugged or unplugged. The other type is a Virtual COM port. This is a recognized COM port and can be accessed as a standard communication port. The Virtual COM port is resident driver and is not unloaded even if the USB cable is unplugged. In this case, connection between application and the driver remains and the reconnecting process is unnecessary. Access to the port is possible without connection to port, but the port cannot be opened. In order to use the WinUSB driver on Windows 7, winusbcompat needs to be installed. For Windows 8 and later, this process is unnecessary.



A resident Virtual COM driver and a transient universal serial bus controller

Transition State of Operating Driver



8.2.2 Port Location Change

The virtual COM port driver reads out the individual ID number of connected display module(s) and stores the ID in a connection map. Upon reconnection, a display module is assigned to the same COM port number as the previous connection. Therefore, multiple display modules can be operated properly using the COM port number assigned for each display module. The virtual COM port driver assigns a new COM port number to newly connected display modules. When a lot of display modules are subsequently initialized, virtual COM port driver is not suitable as a lot of ports are consumed. In this case, it is recommended to use the WinUSB driver.

8.2.3 Initial Installation Procedure (Virtual COM Port Driver)

When a display module is interfaced using the virtual COM port driver, the device driver needs to be installed. Once the installer is executed, the USB Virtual COM port driver and universal serial bus controller are installed. No connections are mapped to the driver yet.
When accessing the COM port from application software, it searches for the USB port and searches for the GT module. When the GT module is found, it is registered in the map to associate it with the Virtual COM port. Afterwards, data transmission is made according to the mapped COM port number and ID number. If multiple GT modules are connected, the first GT module found is registered first.

8.2.4 Adding a Display

If another display must be connected via USB, then an additional USB Virtual COM port driver must be installed. The installer stored in the following folder must be executed:

Installer (64Bit OS)
C:¥Program Files (x86)¥Noritake Itron¥USB_VCOM_drivers¥install_vcom_port_64bit.exe
Installer (32Bit OS)
C:¥Program Files¥Noritake Itron¥USB_VCOM_drivers¥install_vcom_port_32bit.exe

After an additional driver is installed and an additional GT module is connected via USB, when the application software accesses to newly installed COM, the USB port is searched and a connection with the new GT module is mapped.
Every time a new GT module is added, the driver installer must be executed. To assign COM port number to designated ID number, VCOM driver is installed and mapped one by one. The COM port number can also be changed with Device Manager after driver installation.

8.2.5 Port Location Change Procedure

The assigned port number is mapped and retrieved after the OS restarts. The USB mapping can be changed if the USB cable is plugged into a different USB port. If the USB mapping behaves incorrectly and USB communication is not working properly, the map file needs to be reset. The map file can be reset by using the Map Initialization TOOL.

The Map initialization TOOL is stored in the following folder:

Map initialization TOOL (64Bit OS)

C:¥Program Files (x86)¥Noritake Itron¥USB_VCOM_drivers¥reset_vcom_usb_mapping.bat

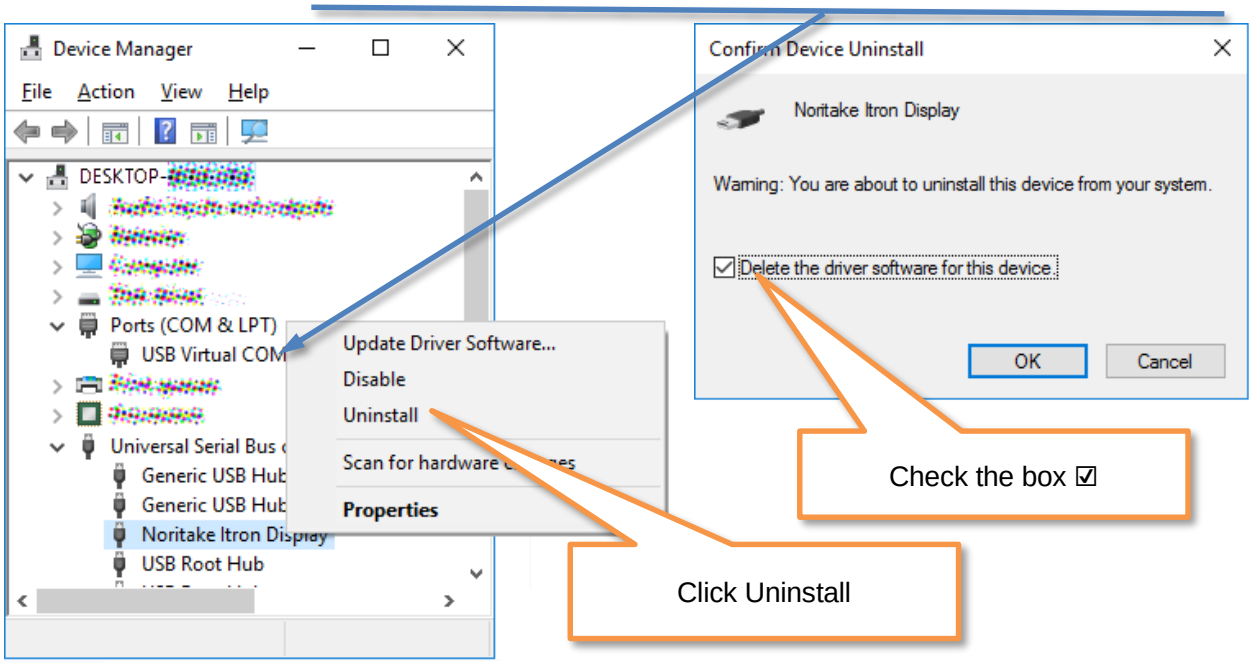
Map initialization TOOL (32Bit OS)

C:¥Program Files¥Noritake Itron¥USB_VCOM_drivers¥reset_vcom_usb_mapping.bat

Double-click the “reset_com_usb_mapping.bat” file to reset the map file.
Subsequently, GT module is connected to USB one by one and accesses to Virtual COM port from application software. By this access, the USB port is searched and USB port found to be assigned to GT module is registered in map.

8.2.6 Virtual COM Driver Uninstall

If the WinUSB driver is used instead of the virtual COM driver, the virtual COM driver needs to be uninstalled. The driver is comprised of a resident and a transient driver. Uninstall the Virtual COM driver while checking the “Delete the driver software for this device” checkbox. If the box is not checked and the software remains, the virtual COM driver will be automatically reinstalled when the module is unplugged and then plugged-in again. Even if the virtual COM port is not deleted, it does not affect operation.



Using WinUSB, when the module is unplugged then plugged-in again, the WinUSB driver is automatically installed. For a Windows7 user, the WinUSB driver needs to be installed using winusbcompact

8.3 Software TIPs

8.3.1 Initialization of Display by Sending Command

(1) Basic Initialization: ESC @(1bh, 40h)

The display module can be initialized with the ESC @(1bh, 40h) command, however, the following exceptions apply:

- Jumper settings are NOT reloaded.
- Received buffer is NOT cleared.
- General-purpose I/O port is NOT initialized.

When changing MSW 48 and 49, the settings are not effected even after this command is executed.

(2) Deep Initialization: User Setup Mode

All settings can be reset (including the exceptions shown above) by ending user setup mode. This can be done with the following procedure:

Start User Setup Mode and then end it.

User Setup Mode Start
Code: 1Fh 28h 65h 01h 49h 4Eh
User Setup Mode End
Code: 1Fh 28h 65h 02h 4Fh 55h 54h
Wait for 1 second

Data writing needs a delay of at least 1 second after submission of the “User Setup Mode End” command because any data/command written before completion of internal processing will be discarded.

8.3.2 VCOM Driver (DiscardInBuffer(),BytesToRead)

When the VCOM driver is used with System.IO.Ports.SerialPort on .NET Framework, the DiscardInBuffer() method may not perform properly. Execute readout to make the receive buffer empty.

The BytesToRead property also returns zero at all times. If this property is not used and there is no data, program it to exit reading by Timeout.

```
COM.ReadTimeout = 1;
try
    {
        for (; ; ) { rb = COM.ReadByte(); }
    }
catch { }
```

8.4 Initial Setting and Writing Protocol

Communication protocol is hardware handshake only and non-procedural. The display module has an internal initialization function, but the basic displaying function can be used without specific initialization. After power on, wait until initialization is complete (1500ms Max) and write display data to the module. Display data is based on ASCII characters. Commands using various functions utilize an expanded sequence starting with the ESC character or other non-viewable characters. Write communication needs to be controlled with hardware handshaking.

8.5 Memory Switch Setting Item

The display module can be operated with non-default settings when memory switches are changed. Settings can be changed either by editing memory switch values or via commands.

Memory Switch Reference

SW No.	Item	Description	Default
0	International font set	A part of ASCII font set is changed to unique letters for designated country. For example, 5Ch is ¥ for Japan.	00h (For USA)
1	Character table type	Select fonts for 80h~FFh font code.	00h (For USA, Standard Europe)
2	Horizontal Scrolling Speed	Set horizontal scrolling speed.	00h
3	Reverse display	Reverse display setting ON/OFF.	00h (OFF)
4	Write mixture display mode	Sets the write mixture mode. When Thru, background is not overwritten.	10h (Normal)
5	Brightness level setting	Set backlight brightness level for entire display screen.	FFh (Brightness 100%)
7	Write screen mode	Sets the write screen mode for base window.	00h (Display screen mode)
8	Font size	Select font size of a character.	01h (6x8 pixels)
9	2-byte character	Sets 2-byte character ON/OFF.	00h (OFF)
10	Font magnification X	Select horizontal enlargement of displaying characters	01h (Horizontal X1)
11	Font magnification Y	Select vertical enlargement of displaying characters	01h (Vertical X1)
12	Character style	Character style setting.	00h (Normal)
13	2-byte character type	Sets 2-byte character type.	00h (Japanese)
16	Download character restore at power-on	Select whether or not restore 6x8 pixel fonts stored in FROM to RAM (FROM→RAM) 6×8 pixel (00h = Don't restore)	00h (Don’t restore)
17	Download character restore at power-on	Select whether or not restore 8x16,12x24,16x32 pixel fonts stored in FROM to RAM (FROM→RAM) 8×16 pixel (00h = Don't restore) *2	00h (Don’t restore)

18	Download character restore at power-on	Select whether or not restore 16x16, 32x32 pixel fonts stored in FROM to RAM (FROM→RAM) 16×16 pixel (00h = Don't restore) *3	00h (Don't restore)
19	FROM Macro execution at power-on	Select whether or not macros are executed upon startup.	00h (Not execute)
48	UART Baud rate setting	Set baud rate for UART. Jumper setting is required to enable. 00h: 19200bps (default) 01h: 4800bps 02h: 9600bps 03h: 19200bps 04h: 38400bps 05h: 57600bps 06h: 115200bps	00h (19200BPS)
49	UART Parity	Select parity for UART. 00h: None 01h: Even 02h: Odd	00h (None)
52	Macro end code Enable/Disable	Select the serial data value that stops macro execution.	00h (Stop macro with any data byte)
53	Macro end code	Select data which end macro when Macro End Data Setup is enabled.	00h
54	Macro end Clear Screen setting	Select if the screen is blanked after macro ends.	00h (Cleared after macro ends)
58	Touch sensitivity (signal gain) setting	This is touch controller parameter. This should be left at the factory default value.	06h
59	Touch sensitivity (threshold) setting	This is touch controller parameter. Setup procedure is shown in this application note	50h
62	Touch sensitivity setting selection at startup *1	00h: Apply the setting values of Memory Switch 58 and 59 01h: Apply Touch Setting Package value	00h
63	Touch Setting Package selection at startup *1	00h: Factory Setting 01h: Touch Setting Package 1 02h: Touch Setting Package 2 03h: Touch Setting Package 3 04h: Touch Setting Package 4	00h

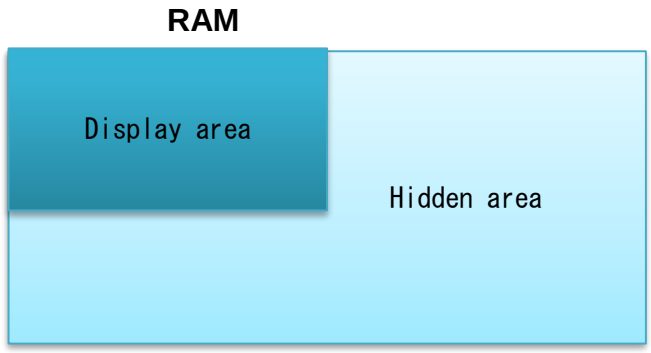
*1: Firm No.: F1.20 or later

*2: If setting is 01h, download characters for 12×24 pixel and 16×32 pixel are also restored.

*3: If setting is 01h, download characters for 32×32 pixel are also restored.

8.6 Display Memory (RAM)

Written data is processed, internally converted to a graphical image, and then stored in RAM. Since the RAM capacity is larger than the number of display screen pixels, only part of the data stored in RAM is displayed on screen. RAM has display area and hidden area.



The hidden area can be used as a work area to hide incomplete display images from the operator or to prepare scrolling data.

8.7 Character Font (Font Data)

8.7.1 Available Font

The available built in fonts are as follows.

Built-in Fonts

1-byte font: 6×8, 8×16, 12×24, 16×32 pixel
Alphanumeric/ANK, International font (Refer to DS-1600-0004-XX)

2-byte font: 16×16 pixel
Japanese Kanji (Refer to DS-906-0002-XX)
Korean (Refer to DS-954-0008-XX)
Simplified Chinese (Refer to DS-954-0006-XX)
Traditional Chinese (Refer to DS-954-0007-XX)

2-byte font: 32×32 pixel
Japanese Kanji (Refer to DS-906-0003-XX)

Outline font:
– SourceHanSansCN-Normal.otf
– SourceHanSansJP-Normal.otf
– SourceHanSansKR-Normal.otf
– SourceHanSansTWHK-Normal.otf

(Reference: URL https://github.com/adobe-fonts/source-han-sans/)

User registration outline font

A font of arbitrary TTF / OTF format * can be registered in the FROM 2 area and used.

* TTF format can be used with Firmware version F1.20 or later in GT800X480A-C903PA

8.7.2 Font Table

The following table represents a 1-byte font code space. For specific font data, refer to the specification sheet.

ANK (1-byte font)

	0_H	1_H	2_H	3_H	4_H	5_H	6_H	7_H	8_H	9_H	A_H	B_H	C_H	D_H	E_H	F_H
_0H	Command		Common Font (ASCII code)						FROM User Font (Select with ESC t n)							
_1H																
_2H																
_3H																
_4H																
_5H																
_6H																
_7H																
_8H																
_9H																
_AH																
_BH																
_CH																
_DH																
_EH																
_FH																

Table of 1-byte font has three types of fields.

00Hex~1FHex: Field for functions. For example, writing 0DHex(CR), cursor move to left end of display screen(or user window).

20Hex~7FHex: Field for ASCII complaint alphanumeric fonts

80Hex~FFHex: Field for expanded font area. Font set can be selected with the" character table type" command.

n	Font Type
0	PC437 (USA – Euro standard)
1	Katakana - Japanese
2	PC850 (Multilingual)
3	PC860 (Portuguese)
4	PC863 (Canadian-French)
5	PC865 (Nordic)
16	WPC1252
17	PC866 (Cyrillic #2)
18	PC852 (Latin 2)
19	PC858
254	UTF-8
255	User table

If UTF-8 is selected, font type automatically changes to a multi-byte font, however, 00Hex~7FHex is compatible to the 1-byte font and 80Hex~FFHex is the start of a multi-byte character. The International Font and 2-Byte Font Mode are ignored.

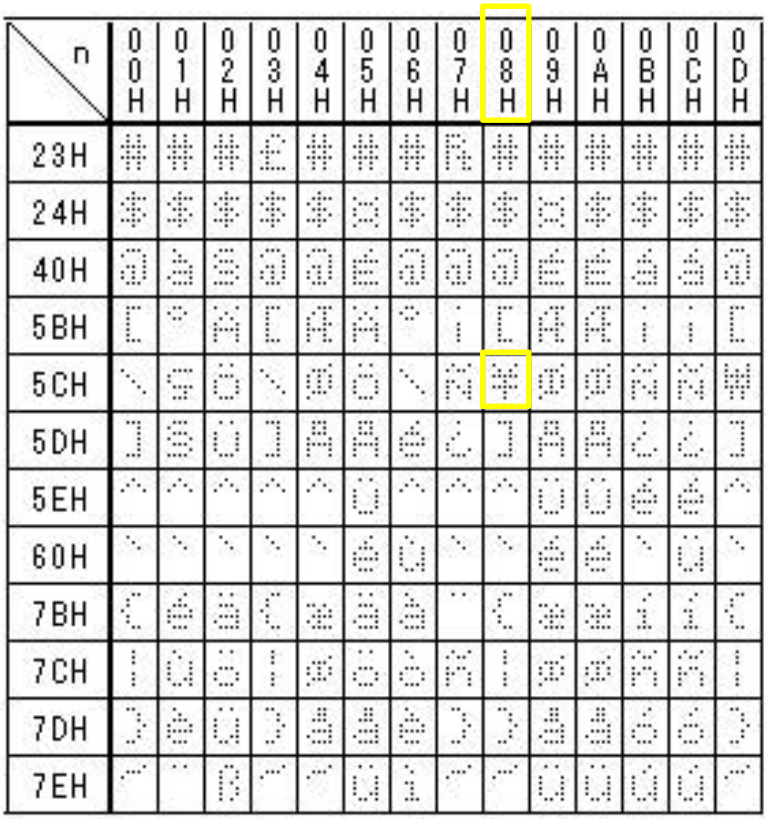
This selection change does not change on characters already written on the display.

International Font Set

Selection of International Font set makes fonts in a part of basic font field (20Hex~7FHex) changed. For example, if selecting Japanese (08H), “ ”(Character code 5CHex） changes to “ ”

Selection is made with the international font set command.

n	Language
0	USA
1	French
2	German
3	English
4	Danish Ⅰ
5	Swedish
6	Italian
7	Spanish
8	Japanese
9	Norwegian
10(0AH)	Danish Ⅱ
11(0BH)	Spanish Ⅱ
12(0CH)	Latin American
13(0DH)	Korean



If UTF-8 is selected, the International Font and 2-Byte Font Mode are ignored.

This selection change does not change on characters already written on the display.

JIS, Simplified Chinese, Traditional Chinese, Korean (2-byte characters)

These are 2-byte fonts. Write font code after writing the commands described below. Even if setup is changed, characters that are already on-screen will not change. Therefore, multiple types of fonts can be displayed together by writing font code after the character table type is changed.

2-Byte Font Display Procedure

(Commands except for character table type setting are the same for all setup examples)

Japanese character type example

1FH, 28H, 67H, 01H, 02H ‘ 8x16 front type setting
1FH, 28H, 67H, 02H, 01H ‘ 2-byte font mode setting
1FH, 28H, 67H, 03H, 00H ‘ Select Japanese
88H, A2H ‘ “阿” is displayed

Korean character type example

1FH, 28H, 67H, 01H, 02H ‘ 8x16 front type setting
1FH, 28H, 67H, 02H, 01H ‘ 2 bytes font mode setting
1FH, 28H, 67H, 03H, 01H ‘ Select Korean
Write font code

Simplified Chinese character type example

1FH, 28H, 67H, 01H, 02H ‘ 8x16 front type setting
1FH, 28H, 67H, 02H, 01H ‘ 2 bytes font mode setting
1FH, 28H, 67H, 03H, 02H ‘ Select Simplified Chinese
Write font code

Traditional Chinese character type example

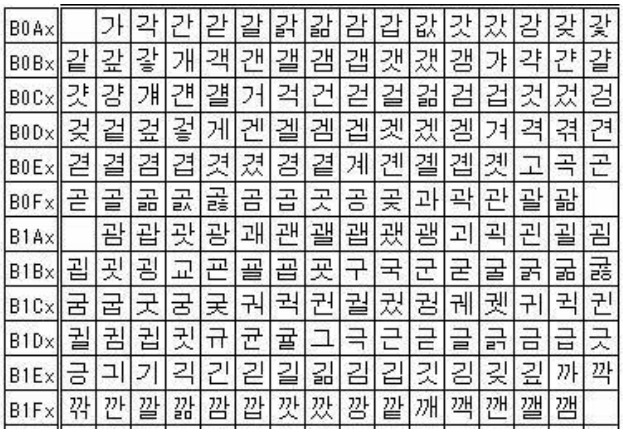
1FH, 28H, 67H, 01H, 02H ‘ 8x16 front type setting
1FH, 28H, 67H, 02H, 01H ‘ 2 bytes font mode setting
1FH, 28H, 67H, 03H, 03H ‘ Selection of Traditional Chinese
Write font code

Each font is complaint with the indicated standard and code areas are described below.

Font	**Standard**	**2-Byte Code Area**
JIS Kanji	JISX208 (Shift-JIS)	8140H~9FF0H, E040H~EFFCH
Korean	KSC5601-87	A1A1H~FEFEH
Simplified Chinese	GB2312-80	A1A1H~FEFEH
Traditional Chinese	Big-5	A140H~FEFEH

JIS Font Example

Korean Font Example



Traditional Chinese Font Example

Simplified Chinese Font Example

For complete font table, refer to product specification.

8.7.3 Standard Built-in Outline Font

With outline fonts, large characters can be displayed with smooth edges.

Steps to Display an Outline Font

Setting changes do not affect characters already present on the display. This allows the display to show multiple fonts by deliberately changing font settings before specific characters are displayed. Each font setting is valid until initialization or reboot.

Setting example for single byte alphanumeric display (ASCII):

```
1Fh, 28h, 67h, 08h, 00h     'Outline font type select > Japanese
1Fh, 28h, 67h, 01h, 00h     'Font size select > outline font
1Fh, 28h, 67h, 06h, 64h, 00h, 00h, 00h, 00h, 00h, 00h, 00h
 'Outline font size > character line height 100px other automatic
41h, 42h, 43h       ' "ABC" is displayed (ASCII)
```

Example of setting Japanese display (Shift-JIS):

```
1Fh, 28h, 67h, 08h, 00h     'Outline font type select > Japanese
1Fh, 28h, 67h, 01h, 00h     'Font size select > outline font
1Fh, 28h, 67h, 06h, 64h, 00h, 00h, 00h, 00h, 00h, 00h, 00h
 ' Outline font size > character line height 100px other automatic
1Bh, 74h, 00h ' Character Table type > Select other than UTF-8 input
1Fh, 28h, 67h, 02h, 01h     '2-byte character > ON
1Fh, 28h, 67h, 03h, 00h '2-byte character type > Japanese (SHIFT-JIS)
88h, A2h' "阿" is displayed
```

Example of setting Japanese display（UTF-8）：

```
1Fh, 28h, 67h, 08h, 00h     'Outline font type select > Japanese
1Fh, 28h, 67h, 01h, 00h     'Font size select > outline font
1Fh, 28h, 67h, 06h, 64h, 00h, 00h, 00h, 00h, 00h, 00h, 00h
 ' Outline font size > character line height 100px other automatic
1Bh, 74h, FEh ' Character Table type > UTF-8
E9h, 98h, BFh       ' "阿" is displayed
```

To display Korean, Chinese Simplified / Traditional Chinese, change "outline font type selection" "2-byte character mode" to the corresponding language respectively.

8.7.4 User Supplied Outline Font

When you want to display a font of a design different from the standard loaded outline font, you can use it by registering an arbitrary TTF / OTF format font in FROM 2 in advance. You can also use free fonts that are distributed in general.

Procedure for registering outline font

It is registered in FROM 2 by sending font data after the general memory data storage command.
In the following command example, register the font file "851 MkPOP_001.ttf Capacity: 1,306,896 (13F110h) byte" at 0000.0000h address of FROM2. Multiple font files can be registered in the empty area of FROM 2. Files written to FROM 2 once are retained even when the power is turned off.

Example of registering an outline font file（851MkPOP_001.ttf　1,306,896(13F110h)byte）:
1Fh, 28h, 65h, 18h, 10h, F1h, 13h, 10h, 00h, 00h, 00h, Font Data ' General-purpose memory store

Procedure for registering User registration outline font

By specifying the FROM 2 address and capacity of the registered font file with user font file selection command, characters are displayed with that font. When multiple font files are registered, you can switch fonts of different designs by specifying them again. Please note that you cannot select a font file whose capacity exceeds the upper limit.
In the following command example, the font file "851MkPOP_001.ttf, capacity: 1,306,896 (13F110h) byte, address: 0000.0000h" registered in the above example is selected and displayed.

Example of user registration outline font display setting (UTF-8):

```
1Fh, 28h, 67h, 07h, 00h, 00h, 00h, 00h, 10h, F1h, 13h, 00h ' User-supplied font file selection
1Fh, 28h, 67h, 08h, FFh    'Outline font type select> User-supplied font file
1Fh, 28h, 67h, 01h, 00h    'Font size select > Outline font
1Fh, 28h, 67h, 06h, 64h, 00h, 00h, 00h, 00h, 00h, 00h, 00h
 ' Outline font size > character line height 100px other automatic
1Bh, 74h, FEh   ' Character Table type > UTF-8
E9h, 98h, BFh    ' "阿" is displayed
```

The support tool "GT-Packer" can easily register multiple font files. In addition, examples of user font file selection command are output, so please use.

Outline font capacity upper limit

Those whose font file capacity exceeds the following upper limit cannot be used.

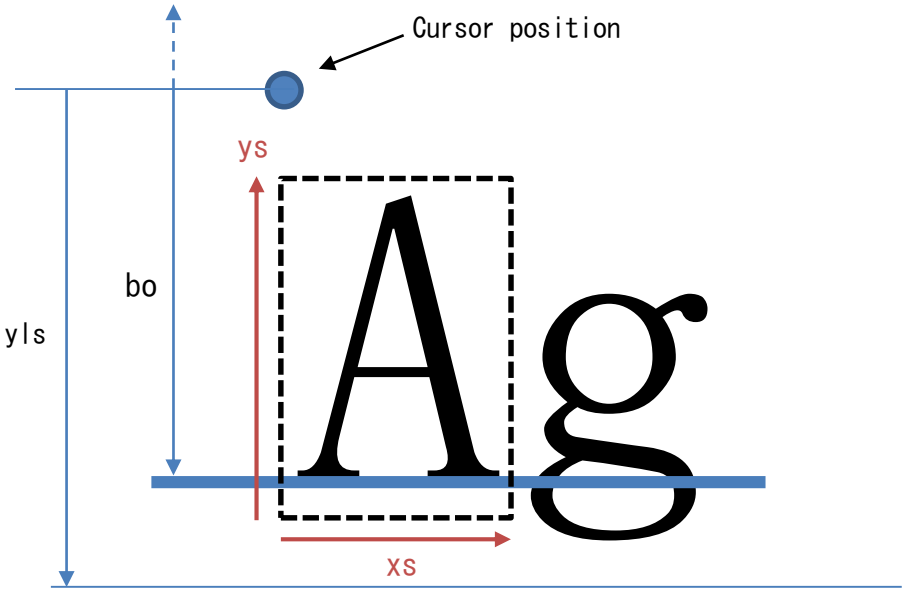
GT480X272A-C903PA	:	8MB (8,388,608Byte)
GT800X480A-C903PA	:	32MB (33,554,432Byte)

On character missing and size specification of user registration outline font.

Use the character line height (character writing area) of the outline font size specification command to adjust the character size. Font size and baseline offset are recommended automatically, but depending on the font design, some letters such as "g" or "y" with descenders and some symbols such as "|" and "/" may be missing. In that case, please set it appropriately referring to the following procedure.

Missing Character Adjustment Procedure:

· Enter an arbitrary value (character line height to be displayed) in "yls (the number of pixels in the Y-direction of the character writing area and background writing area)".
· Enter 4/5ths of "yls" in "ys (character size in Y direction)".
· Enter "0000h (automatic calculation)" in "xs (character size in X direction)".
· Put a value that is about 4/5ths of "yls" in "bo (distance from the cursor position to the baseline)".
· Send the above values with the outline font size designation command to the display and test characters like "g" "y" "|" "/".
· Each value follows the direction of the associated arrow in the following figure. Please set 'ys' and 'bo' appropriately to fix any missing characters.



8.8 Command Table (Sort by code) GT -C903PA

No.	Name	Code（Hex code or parameter, [Parameter name.number] means bit length）									
1	Backspace	08h									
2	Horizontal Tab	09h									
3	Line Feed	0Ah									
4	Home Position	0Bh									
5	Display Clear	0Ch									
6	Carriage Return	0Dh									
7	Line Clear	18h									
8	Line end Clear	19h									
9	Download character ON/OFF	1Bh	25h	n.8=0/1							
10	Download character definition	1Bh	26h	a.8	c1.8	c2.8	[x(1) d1…d(y*X(1) … x(c2-c1+1) d(1) …d(y*x(c2-c1+1))]				
11	Downloaded character delete	1Bh	3Fh	a.8	c.8						
12	Initialize Display	1Bh	40h								
13	International font set	1Bh	52h	n.8							
14	Character Table type	1Bh	74h	n.8							
15	Memory re-write mode start	1Ch	7Ch	4Dh	m=D0	d1='M'	'O'	'D'	'E'	'I'	'N'
16	Over-write mode	1Fh	01h								
17	Vertical scroll mode	1Fh	02h								
18	Horizontal scroll mode	1Fh	03h								
19	Horizontal scroll mode, Scroll ON	1Fh	05h								
20	Cursor set	1Fh	24h	X.16	Y.16						

21	Wait	1Fh	28h	61h	01	t.8						(About t x 0.47 sec.)
22	Short Wait	1Fh	28h	61h	02h	t.8						(About t x 16 msec.)
23	Blink	1Fh	28h	61h	11h	p.8	t1.8	t2.8	c.8			
24	Display power ON/OFF	1Fh	28h	61h	40h	p.8						
25	Scroll display action XY	1Fh	28h	61h	A0h	sX.16	sY.16	c.16	s.8			
26	Curtain display action XY	1Fh	28h	61h	A2h	v.8	s.8	pR.8	pG.8	pB.8		
27	Spring display action XY	1Fh	28h	61h	A3h	v.8	s.8	pX.16	pY.16			
28	Random display action XY	1Fh	28h	61h	A4h	v.8	s.8	pX.16	pY.16			
29	Fade In display action XY	1Fh	28h	61h	A5h	s.8	pX.16	pY.16				
30	Fade Out display action XY	1Fh	28h	61h	A6h	s.8						
31	Pixel drawing	1Fh	28h	64h	10h	pen.8	x.16	y.16				
32	Line/Box pattern drawing	1Fh	28h	64h	11h	mode.8	pen.8	x1.16	y1.16	x2.16	y2.16	
33	User setup mode start	1Fh	28h	65h	01h	d1=49h	d2=4Eh					
34	User setup mode end	1Fh	28h	65h	02h	d1=4Fh	d2=55h	d3=54h				
35	Memory SW setting	1Fh	28h	65h	03h	a<=3Fh	b.8					
						a=FFh	b.8	c(1)	d(1)	…	c(b)	d(b)
36	Memory SW data send (Single)	1Fh	28h	65h	04h	a<=3Fh						
37	Memory SW data send (Multiple)	1Fh	28h	65h	04h	a=FFh	b.8	c.8(1) … c.8(b)				
38	FROM bit image definition	1Fh	28h	65h	10h	a.24	s.24	d(1)	…	d(s)		
39	Download character save	1Fh	28h	65h	11h	a=1/2/3/4/5/6(6x8/8x16/16x16/16x32/32x32/12x24)						
40	FROM Macro define / delete	1Fh	28h	65h	12h	a.8	p.16	t1.8	t2.8	d(1)…d(p)		
41	FROM User font definition	1Fh	28h	65h	13h	m=1/2/3/4		p(1) …	p(Data volume for 128 characters)			
42	FROM extension font definition	1Fh	28h	65h	15h	a.8	b.8	p(1)	…	p(65536)		
43	General-purpose memory store / FROM2 image store	1Fh	28h	65h	18h	s.24	m1.8	a1.24	d(1)	…	d(s)	

44	General-purpose memory transfer	1Fh	28h	65h	19h	s.24	m1.8	a1.24	m2.8	a2.24	
45	Touch Setting Package Data Store	1Fh	28h	65h	1Ch	a.8	d[1]	…	d[1024]		
46	Download character restore	1Fh	28h	65h	21h	a=1/2/3/4/5/6(6x8/8x16/16x16/16x32/32x32/12x24)					
47	General-purpose memory send	1Fh	28h	65h	28h	s.24	m1.8	a1.24			
48	Display status send	1Fh	28h	65h	40h	a.8	[b.8	c.8]			
49	RAM bit image definition	1Fh	28h	66h	01h	a.24	s.24	d(1)	…	d(s)	
50	Downloaded bit image display	1Fh	28h	66h	10h	m.8	a.24	xS.16	x.16	y.16	fmt.8
51	Real-time bit image display	1Fh	28h	66h	11h	x.16	y.16	fmt	d(1)	…	d(...)
52	Defined Package Bit Image Displaying	1Fh	28h	66h	20h	m.8	a.24	p.16	fmt.8		
53	Packaged Real-time bit image display	1Fh	28h	66h	21h	x.16	y.16	fmt	d(1)	…	d(n)
54	Font size select	1Fh	28h	67h	01h	m.8					
55	2-byte character	1Fh	28h	67h	02h	m.8					
56	2-byte character type	1Fh	28h	67h	03h	m.8	The same function as 1F 28 67 0F m				
57	Font Width	1Fh	28h	67h	04h	m.8					
58	FROM Extended Font	1Fh	28h	67h	05h	n.8					
59	Outline font size	1Fh	28h	67h	06h	yls.16	ys.16	xs.16	bo.16		
60	User-supplied font file address and size	1Fh	28h	67h	07h	ad.32	sz.32				
61	Outline font type select	1Fh	28h	67h	08h	n.8					
62	2-byte character type	1Fh	28h	67h	0Fh	m.8	The same function as 1F 28 67 03 m				
63	16×16 Download character definition	1Fh	28h	67h	10h	c1.8	c2.8	d(1)	…	d(32)	
64	16×16 Downloaded character delete	1Fh	28h	67h	11h	c1.8	c2.8				
65	32×32 Download character definition	1Fh	28h	67h	14h	c1.8	c2 .8	d(1)	…	d(128)	
66	32×32 Downloaded character delete	1Fh	28h	67h	15h	c1.8	c2.8				
67	Font magnification	1Fh	28h	67h	40h	X.8	Y.8				

68	Character style	1Fh	28h	67h	41h	b.8					
69	Character Color	1Fh	28h	67h	50h	pR.8	pG.8	pB.8			
70	Background Color	1Fh	28h	67h	51h	pR.8	pG.8	pB.8			
71	Shadow and Bordering Color	1Fh	28h	67h	52h	pR.8	pG.8	pB.8			
72	Background Color enable / disable	1Fh	28h	67h	58h	b.8					
73	Macro end condition	1Fh	28h	69h	20h	a.8	b.8	c.8			
74	I/O Port Input / Output setting	1Fh	28h	70h	01h	n.8	a.8				
75	I/O Port Output	1Fh	28h	70h	10h	n.8	a.8				
76	I/O Port Input	1Fh	28h	70h	20h	n.8					
77	Current Window select	1Fh	28h	77h	01h	a.8 =0/1/2/3/4					
78	User Window define / cancel	1Fh	28h	77h	02h	a.8	b .8	[xP.16	yP.16	xS.16	yS.16]
79	Write screen mode select	1Fh	28h	77h	10h	a.8					
80	RAM Macro define / delete	1Fh	3Ah	p.16	[d(1)	…	d(p)]				
81	Touch Parameter Setting	1Fh	4Bh	70h	a.8	[b.8	[c.8]				
82	Touch Setting Package Selection	1Fh	4Bh	70h	10h	a.8					
83	Touch Mode Selection: Single-Touch Mode/ Multi-Touch Mode	1Fh	50h	01h	n.8						
84	Touch Panel Control Mode Definition	1Fh	50h	10h	ch.8	n.8 =0/1/2	[sn	…	]		
85	Touch Panel Data Transmit ON/OFF	1Fh	50h	20h	m.8=0/1						
86	Touch Panel Channel Select	1Fh	50h	21h	ch.8 =0/1/2/3						
87	Brightness level setting (for Backlight)	1Fh	58h	n.8							
88	Macro execution	1Fh	5Eh	a.8=0/1/2/3/4	t1.8	t2.8					
89	Reverse display	1Fh	72h	n.8=0/1							
90	Horizontal scroll speed	1Fh	73h	n.8							

91	Write mixture display mode	1Fh	77h	n.8=0/1/2/3(over/OR/AND/ExOR)

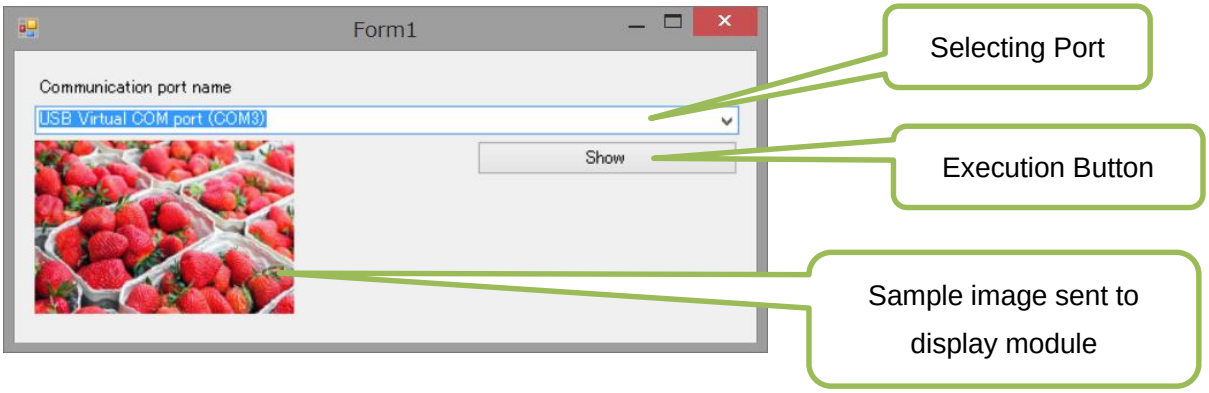
How to use the command table:
Commands are sorted by hex code.
User defined parameters are represented with a letter and number separated with a period and the possible parameter values follow.
For example, x.16 means that parameter “x” is 16 bits (or 2 bytes). The byte order for multi-byte parameters is least significant byte (LSB) first.
In the software specification, x.16 is denoted as xL, and xH (lower and higher byte). For detailed command information, refer to the software specification.

8.9 Program Example of Microsoft Visual Studio on Windows PC

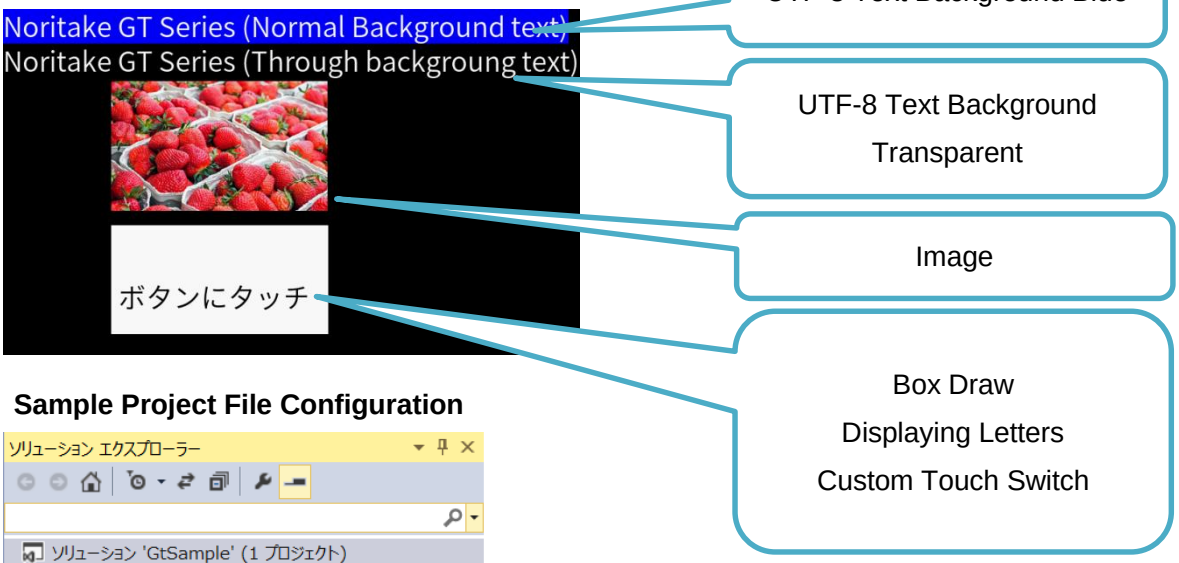
We prepared a sample project in Microsoft's Visual Studio (C#).

This is a sample to operate a USB-connected GT module from a PC via Virtual COM port or WinUSB driver. The project contains a file that gathers GT module commands into a class library, which can be added to user software for easy command access. When you click the [Show] button, the program will initialize the display, wait 1 second, write to the GT module and wait ten seconds for touch switch input. If there is no touch input within ten seconds, the program will time out.

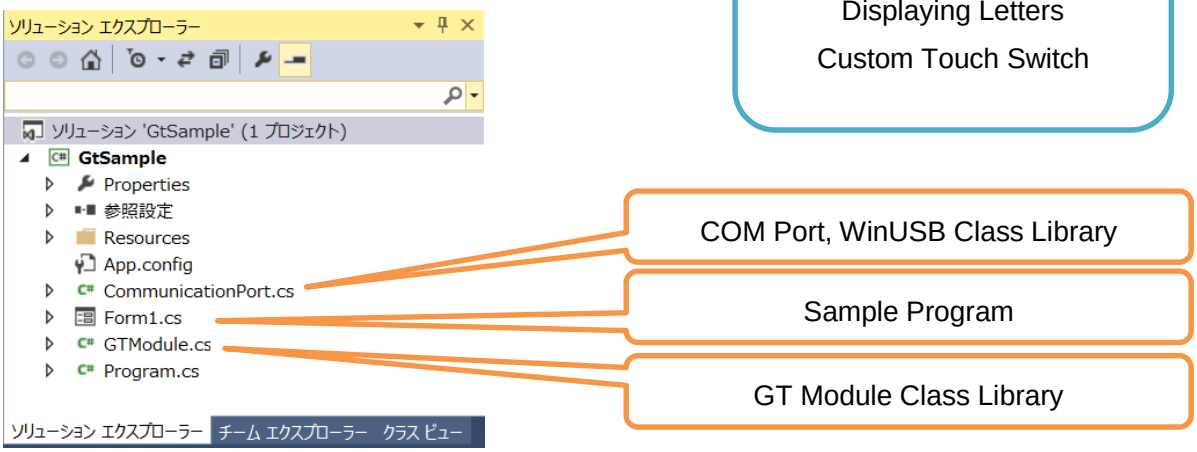
Sample Program Execution Window



GT Module Screen After Project Execution

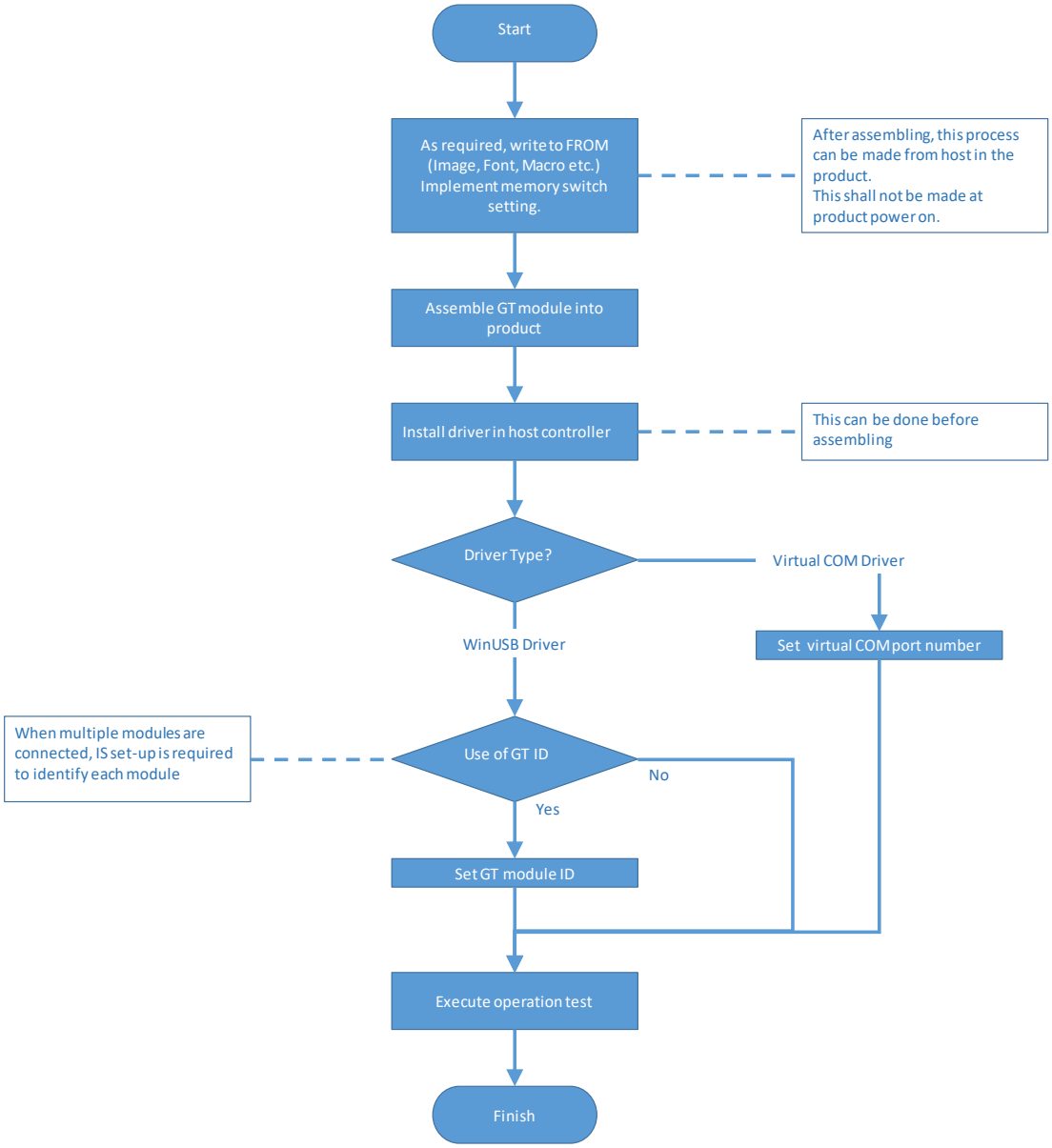


Sample Project File Configuration



9 System Integration（Using USB on Microsoft Windows）

The following procedure describes the basic steps on installing a GT module into a Microsoft Windows system using USB communication.



Note: It is recommended to program FROM only during manufacturing, maintenance and update.
If an FROM write is performed during the module's startup sequence, the firmware may become corrupt. Also, if an inadequate/unstable power supply is used during an FROM write procedure, the firmware may also become corrupt. In these cases, the module needs to be repaired at the factory. Additionally, the FROM has a limited overwrite life, so unnecessary overwriting is not recommended.

10 Troubleshooting

10.1 BUSY Signal on Asynchronous Serial Interface

The GT series command configuration is based on hardware handshaking. Display effects like scroll or blink take a long time to be executed. Therefore, RTS/CTS handshaking is required when using USB communication. When using serial communication, the host and display busy signals should be monitored similarly to RTS/CTS handshaking concepts. If handshaking is unused, display irregularities like missing characters may occur.

10.2 Reset

The display module can be reset by pulling /RESET low for at least 1ms.

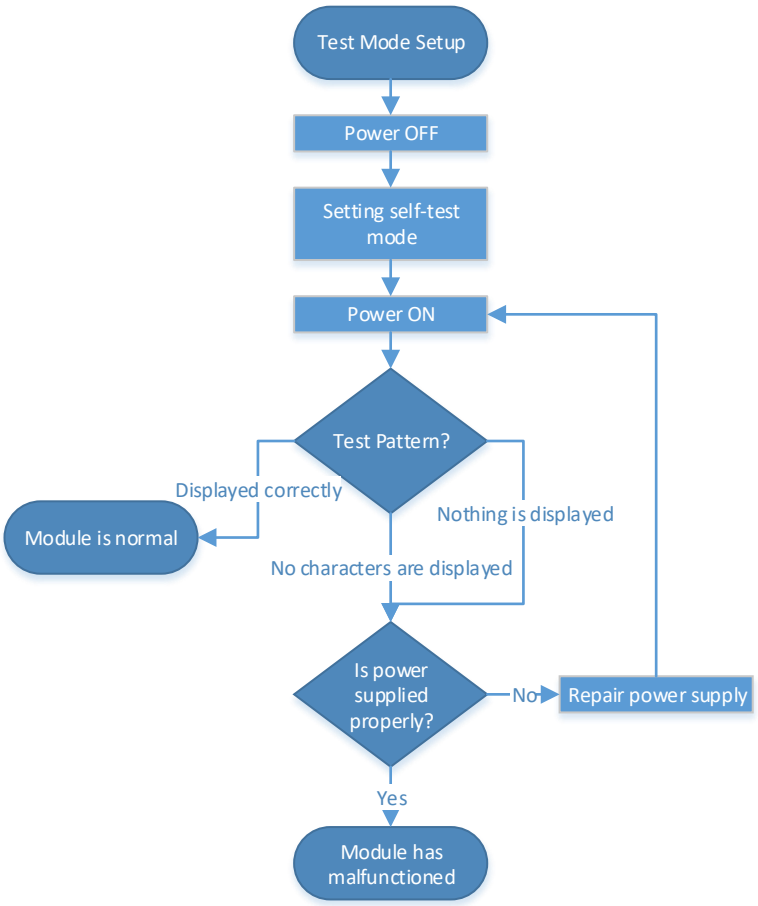
When the module is reset, SBUSY / DTR = HI (busy state) is set, so please communicate with the module after SBUSY / DTR = Low (ready state).

10.3 Display Doesn't Light up | Self-test Mode

By sending ASCII code, alphanumeric characters can be displayed on the module without any special initial setup. However, if the display module does not display any images, it is necessary to find the source of the problem. The first item to look at is either the driving circuit or display module. Self-test mode can help in this investigation as it will automatically display test patterns if power is properly applied to the display module.

Refer to "Self-Test Mode Setting" for assistance on how to setup self-test mode.

TEST MODE



10.4 Self-Test Mode Setting

Connect pin 2 of CN8 connector to pin 3 (GND) and turn the power on.

10.5 Stop Automatic Execution of Program Macros

When program macros are programmed and set for automatic execution, the macro will not end unless the program macro end command «B K» is executed. If the end command «B K» is never executed due to a program mistake, you cannot change the program macro. In this case, please use the following methods.

Method 1

① Turn off the power supply.
② Short J7 and make sure the program macro does not come up automatically when power is applied.
③ Turn on the power.
④ Cancel the program macro automatic start.
It can be cancelled with GT-Packer's command function (Commander).
* For the location of J7, refer to an applicable specification.

Method 2 (Firm No.: F1.25 or later)

① Turn off the power supply
② Activate test mode. (See Section 10.4)
③ When test mode connection is released, test mode ends and shifts to normal command mode.
④ Cancel the automatic start of the program macro.
It can be cancelled with GT-Packer's command function (Commander).

10.6 Afterimages

Image persistence may occur if the same screen is displayed for a prolonged period of time. The effect will gradually disappear by displaying a screensaver pattern or by powering off the display. The time needed for the effect to disappear is not fixed, as it depends on the exact usage, screen settings, power settings, environmental temperature, etc.
To avoid image persistence, it is recommended to avoid displaying a fixed pattern or the same image for a prolonged period of time

11 Support TOOLs

Support TOOLs for initial evaluation or data creation can be downloaded from our web page. Contact our sales or customer support for additional TOOLs that are not shown on our web page yet. Example circuit diagrams to drive VFD/TFT and program samples are updated periodically and can be downloaded for your convenience.

Our Webpage URL:

https://www.noritake-itron.jp/eng/index.html

Technical Support URL:

https://www.noritake-itron.jp/eng/cs/index.html

11.1 WinUSB Driver for Windows7

For Windows 8.1 or later, additional installation is unnecessary for the WinUSB driver.

For Windows 7, you need to download and install the installer WinUSB driver from Microsoft.

http://www.catalog.update.microsoft.com/Search.aspx?q=windows%20phone%20winusb

11.2 GU-TFT Operator (GTO)

GTO is screen design tool for the Noritake command controlled TFT module. Screen designs can be made by importing and drawing images, lines, boxes and letters using the GTO GUI. The screen design can be exported as an Arduino sketch. The sketch includes a function reading command for Noritake command controlled TFT modules; it can be used as sample code or a code library. This TOOL can be used without installation.

11.3 MSousi

Macro Sousi is a program macro editor and complier. Using Macro Sousi, a complied program macro can be written to the display module. Program macro source code is similar to the Basic programming language. Installation is required.

11.4 GT Packer

This TOOL provides a quick and easy way to evaluate our Noritake command controlled TFT modules via USB or UART. This application allows the user to display images on GT-CP modules. Choose from either USB or UART to communicate with any of our Noritake command controlled TFT modules.

11.5 GTOP

It is an application software for Windows PC, designs a screen with GUI and converts it to a program for Arduino (Sketch). It also has a function to write other data to Noritake command controlled TFT modules.

11.6 GTOMP

This support software allows the user to easily create GUI prototype designs and P-macro programs as well as send commands and save images to the connected display. GUI elements include: images, text,

touch switches, timers, sliders, etc. Available for Windows platforms.

12 Environmental Sustainability

12.1 ISO14000 Certification

The creed of Noritake, i.e. the principles of quality products and co-prosperity from a global viewpoint, provides a basis for consideration for the global environment. Noritake strives to develop a clean production process, produce green products with less environmental impact to provide society with products and services that are gentle to people and the environment. Noritake Itron Corp. is an ISO14001 certified company.

12.2 RoHS Compliance

The Touch TFT Module standard products are RoHS compliant.

13 Disclaimer and Limitation

Any information and TOOLs published in this document are carefully evaluated; however, correctness of performance under any environmental conditions have not been proven. Whole or partial sample code may be copied to use with our products. In this case, the sample code user shall take responsibility to check the performance on the final creation (i.e. application software, embedded code, etc.). Support TOOLs provided via installer style may include programs licensed from a third party. Any style of analysis, reverse compilation, reverse engineering, or relevant acts are prohibited.

14 Trademark

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- Other company names and product names are a registered trademark of those respective companies.

15 Contact

For any assistance, question, or inquiry, contact to our sales department or customer support at cs@noritake-itron.jp