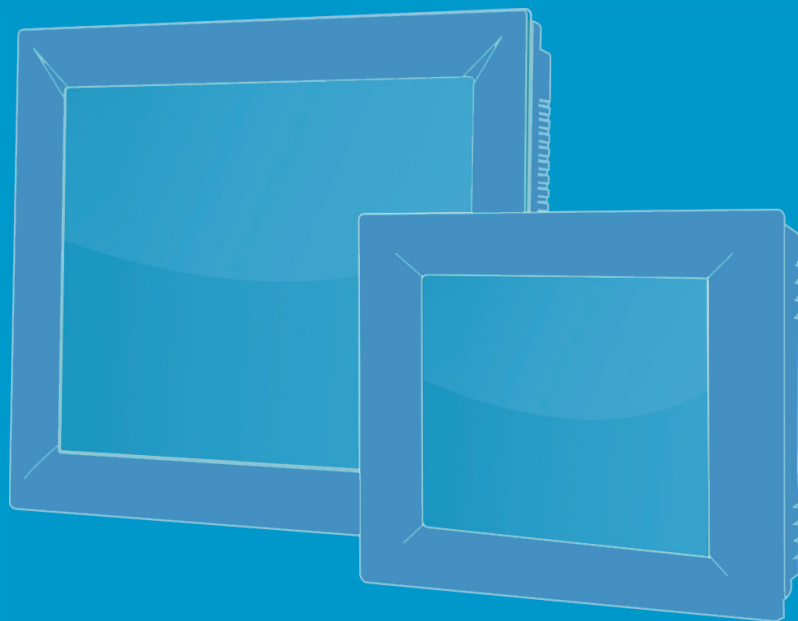




ITA-8100 / ITA-8120 Series

EN 50155 10.4" / 12.1" Panel PC
with Intel Atom® Processor for
Railway Applications

ADVANTECH

Enabling an Intelligent Planet

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Acknowledgments

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Product Warranty (2 years)

Advantech warrants the original purchaser that each of its products will be free from defects in materials and workmanship for two years from the date of purchase.

This warranty does not apply to any products that have been repaired or altered by persons other than repair personnel authorized by Advantech, or products that have been subject to misuse, abuse, accident, or improper installation. Advantech assumes no liability under the terms of this warranty as a consequence of such events.

Because of Advantech's high quality-control standards and rigorous testing, most customers never need to use our repair service. If an Advantech product is defective, it will be repaired or replaced at no charge during the warranty period. For out-of-warranty repairs, customers are billed according to the cost of replacement materials, service time and freight. Please consult your dealer for more details.

If you believe your product is defective, follow the steps outlined below.

1. Collect all the information about the problem encountered. (For example, CPU speed, Advantech products used, other hardware and software used, etc.) Note anything abnormal and list any messages displayed onscreen when the problem occurs.
2. Call your dealer and describe the problem. Please have your manual, product, and any helpful information readily available.
3. If your product is diagnosed as defective, obtain a return merchandise authorization (RMA) number from your dealer. This allows us to process your return more quickly.
4. Carefully pack the defective product, a completed Repair and Replacement Order Card, and a proof of purchase date (such as a photocopy of your sales receipt) into a shippable container. Products returned without a proof of purchase date are not eligible for warranty service.
5. Write the RMA number clearly on the outside of the package and ship the package prepaid to your dealer.

Technical Support and Assistance

1. Visit the Advantech website at <http://support.advantech.com> to obtain the latest product information.
2. Contact your distributor, sales representative, or Advantech's customer service center for technical support if you need additional assistance. Please have the following information ready before calling:
 - Product name and serial number
 - Description of your peripheral attachments
 - Description of your software (operating system, version, application software, etc.)
 - A complete description of the problem
 - The exact wording of any error messages

Safety Instructions

1. Read these safety instructions carefully.
2. Retain this user manual for future reference.
3. Disconnect this equipment from the power outlet before cleaning. Use only a damp cloth for cleaning. Do not use liquid or spray detergents.
4. For pluggable equipment, the power outlet socket must be located near the equipment and easily accessible.
5. Protect the equipment from humidity.
6. Place the equipment on a reliable surface during installation. Dropping or letting the equipment fall may cause damage.
7. The openings on the enclosure are for air convection. Protect the equipment from overheating. Do not cover the openings.
8. Ensure that the voltage of the power source is correct before connecting the equipment to a power outlet.
9. Position the power cord away from high-traffic areas. Do not place anything over the power cord.
10. All cautions and warnings on the equipment should be noted.
11. If the equipment is not used for a long time, disconnect it from the power source to avoid damage from transient over-voltage.
12. Never pour any liquid into an opening. This may cause fire or electrical shock.
13. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
14. If one of the following occurs, have the equipment checked by qualified service personnel:
 - The power cord or plug is damaged.
 - Liquid has penetrated into the equipment.
 - The equipment has been exposed to moisture.
 - The equipment is malfunctioning, or does not operate according to the user manual.
 - The equipment has been dropped and damaged.
 - The equipment shows obvious signs of breakage.
15. Do not leave the equipment in an environment with a storage temperature of below -40 °C (-40 °F) or above 70 °C (158 °F) as this may cause damage. The equipment should be kept in a controlled environment.

16. CAUTION: The battery is at risk of exploding if incorrectly replaced. Replace only with the same type recommended by the manufacturer or an equivalent. Discard used batteries according to the manufacturer's instructions.
17. CAUTION: To avoid risk of electric shock, this equipment must only be connected to supply mains with protective earthing.

In accordance with IEC 704-1:1982 specifications, the sound pressure level at the operator's position does not exceed 70 dB (A).

DISCLAIMER: These instructions are provided in accordance with IEC 704-1. Advantech disclaims all responsibility for the accuracy of any statements contained herein.

Consignes de sécurité

1. Lisez attentivement ces consignes de sécurité.
2. Gardez ce manuel pour référence future.
3. Déconnectez cet équipement de toute prise secteur avant de le nettoyer. Utilisez un chiffon humide. Ne pas utiliser de liquide ou de sprays détergents pour le nettoyage.
4. La prise de courant doit être située près de l'équipement et doit être facilement accessible.
5. Gardez cet équipement à l'abri de l'humidité.
6. La chute de l'équipement pouvant l'endommager, celui-ci doit être installé sur une surface stable.
7. Les ouvertures du boîtier sont nécessaires au refroidissement de l'appareil. Veillez à protéger l'appareil contre la surchauffe. Ne pas couvrir les ouvertures.
8. Assurez-vous que la tension de la source d'alimentation est correcte avant de brancher l'appareil à la prise de courant.
9. Placez le cordon d'alimentation de manière à éviter que des personnes marchent dessus. Veillez à ce qu'aucun objet ne soit placé sur le cordon d'alimentation.
10. Tous les conseils et avertissements concernant ce matériel et son utilisation doivent être lus et compris.
11. Si l'appareil n'est pas utilisé pendant une longue période, débranchez-le de la source d'alimentation pour éviter les dommages causés par des surtensions transitoires.
12. Ne jamais verser de liquide dans une ouverture. Cela peut provoquer un incendie ou un choc électrique.
13. Ne jamais ouvrir l'équipement. Pour des raisons de sécurité, l'équipement ne peut être ouvert que par du personnel qualifié.
14. Si l'une des situations suivantes se présente, faites vérifier le matériel par le personnel de service:
 - Le cordon d'alimentation ou la prise est endommagé.
 - Du liquide a pénétré dans l'appareil.
 - L'équipement a été exposé à l'humidité.
 - L'équipement ne fonctionne pas bien, ou vous ne pouvez pas le faire fonctionner selon le manuel d'utilisation.
 - L'appareil est tombé et est endommagé.
 - L'équipement présente des signes évidents de casse.
15. Ne pas laisser ce matériel dans un environnement où la température de stockage peut descendre en dessous de -40 °C (-40 °F) ou être supérieure à 70 °C (158 °F). Ceci pourrait endommager l'équipement. L'équipement doit être maintenu dans un environnement contrôlé.

16. ATTENTION: Risque d'explosion si la batterie est remplacée de manière incorrecte. Remplacer uniquement avec un modèle recommandé par le fabricant, et éliminer les piles usagées selon les instructions du fabricant.
17. ATTENTION: Pour éviter tout risque d'électrocution, cet équipement ne doit être branché qu'au réseau d'alimentation avec une terre de protection.

Conformément à la norme CEI 704-1:1982, l'opérateur ne doit pas expérimenter un niveau sonore supérieur à 70 dB (A).

AVERTISSEMENT: Ces consignes suivent la norme CEI 704-1.

Advantech décline toute responsabilité concernant l'exactitude des déclarations contenues dans ce document.

Declaration of Conformity

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference. In such cases, users are required to correct the interference at their own expense.

RTC Battery Information

The computer features a battery-powered real-time clock circuit. The battery is at risk of exploding if incorrectly replaced. Replace only with same type recommended by the manufacturer or an equivalent. Discard used batteries according to the manufacturer's instructions.

Disposal of a battery into fire or a hot oven, or by mechanically crushing or cutting the battery, can result in an explosion.

Risque d'explosion si la batterie est remplacée de manière incorrecte. Remplacer uniquement avec un modèle recommandé par le fabricant, et éliminer les piles usagées selon les instructions du fabricant.

Éliminer une batterie dans un feu ou un four chaud, ou écraser ou couper mécaniquement une batterie peut provoquer une explosion. Veuillez à connecter le cordon d'alimentation à une prise de courant avec mise à la terre.

Warnings, Cautions, and Notes

Warning! Warnings indicate conditions that may cause personal injury!



Les avertissements indiquent des conditions qui, si elles ne sont pas observées, peuvent causer des dommages personnels (blessures).

Caution! Cautions are included to help prevent hardware damage and data losses. For example, “The battery is at risk of exploding if incorrectly installed. Do not attempt to recharge, force open, or heat the battery. Replace the battery only with the same type recommended by the manufacturer or an equivalent. Discard used batteries according to the manufacturer's instructions.”



Des précautions sont incluses pour vous aider à éviter d'endommager le matériel ou de perdre des données. Par exemple, “Il y a un risque d'explosion d'une nouvelle batterie, si celle-ci est mal installée.

N'essayez pas de recharger, d'ouvrir de force ou de chauffer la batterie. Remplacez la batterie exclusivement par le même type ou par un type équivalent recommandé par le fabricant. Jeter les batteries usagées conformément aux instructions du fabricant.”

Note! Notes provide additional optional information.



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Chapter 1

General Information

- Introduction
- Specifications
- System Power
- Safety and Environment
- Panel and Cutout Dimensions

1.1 Introduction

Advantech's ITA-8100 / ITA-8120 series touch panel PC is a fanless human machine interface (HMI) equipped with a 10.4-inch / 12.1-inch display with projective capacitive touchscreen aimed at railway applications. The panel's small flat design saves space for easy installation in driver cabins. The configuration flexibly allows the system to be adjusted for specific applications and train models. Designed to withstand operation in harsh environments, ITA-8100 / ITA-8120 supports a wide operating temperature range (-40 ~ 70 °C/-40 ~ 158 °F), and satisfies EN 50155 railway regulations.

1.2 Specifications

1.2.1 System Kernel

- **CPU:** Intel Atom® x7-E3950 quad-core processor @ 2.0 GHz
- **Memory:** 1 x DDR3L SODIMM (4 GB default; supports up to 8 GB)
- **OS Support:** Windows 10 / Linux
- **Storage:** 1 x M.2 2242 SSD (64 GB default)
- **LED:** 1 x Power LED
- **Cooling System:** Fanless design
- **Dimensions (W x H x D):**
ITA-8100 series: 310 x 214 x 70 mm (12.1 x 8.4 x 2.8 in)
ITA-8120 series: 350 x 260 x 71.5 mm (13.8 x 10.2 x 2.8 in)

1.2.2 I/O Ports

- 1 x Power connector (M12 A-coded, 4-pin male)
- 2 x LAN 100/1000 base (M12 X-coded, 8-pin female)
- 2 x RS-422/485 (M12 A-coded, 5-pin female)
- 1 x USB 2.0 (M12 A-coded, 4-pin female)
- 1 x Audio (M12 A-coded, 5-pin male)
- 1 x Digital I/O (M12 A-coded 8-pin female)
- Optional: MVB, CAN, GSM-R, GPS, Wi-Fi, WWAN, RS-232, and more (please contact for more information)

1.2.3 LCD

ITA-8100

Display Type	TFT LED LCD
Size (diagonal)	10.4"
Resolution (Pixels)	1024 x 768 max.
Luminance	500 nits
Contrast Ratio	1000:1
Backlight Adjustment	Automatic with built-in light sensor / Manual (Switched in BIOS)

ITA-8100B

Display Type	TFT LED LCD
Size (diagonal)	10.4"
Resolution (Pixels)	1024 x 768 max.
Luminance	1300 nits
Contrast Ratio	700:1
Backlight Adjustment	Automatic with built-in light sensor / Manual (Switched in BIOS)

ITA-8120

Display Type	TFT LED LCD
Size (diagonal)	12.1"
Resolution (Pixels)	1024 x 768 max.
Luminance	600 nits
Contrast Ratio	1000:1
Backlight Adjustment	Automatic with built-in light sensor / Manual (Switched in BIOS)

Note! *The LCD may have several unusually bright or dark pixels. This phenomenon is commonplace in today's LCD manufacturing.*



1.3 System Power

- **Power Consumption:**
ITA-8100: 30W
ITA-8100B: 35W
ITA-8120: 35W
- **Input Voltage:** 24V_{DC}, 48V_{DC}, 72V_{DC}, 110V_{DC} (±40%)

1.4 Safety and Environment

1.4.1 Safety

- FCC class A
- CE
- UL 62368
- EN 50155:2017
- IP65 rating (front panel)

1.4.2 Environment

- **Operating Temperature:** -40 ~ 70 °C/-40 ~ 158 °F (85 °C/185 °F for 10 minutes)
- **Storage Temperature:** -40 ~ 70 °C/-40 ~ 158 °F
- **Humidity:** 93% @ 40 °C (non-condensing)
- **Shock and Vibration:** IEC 61373

1.5 Panel and Cutout Dimensions

■ ITA-8100

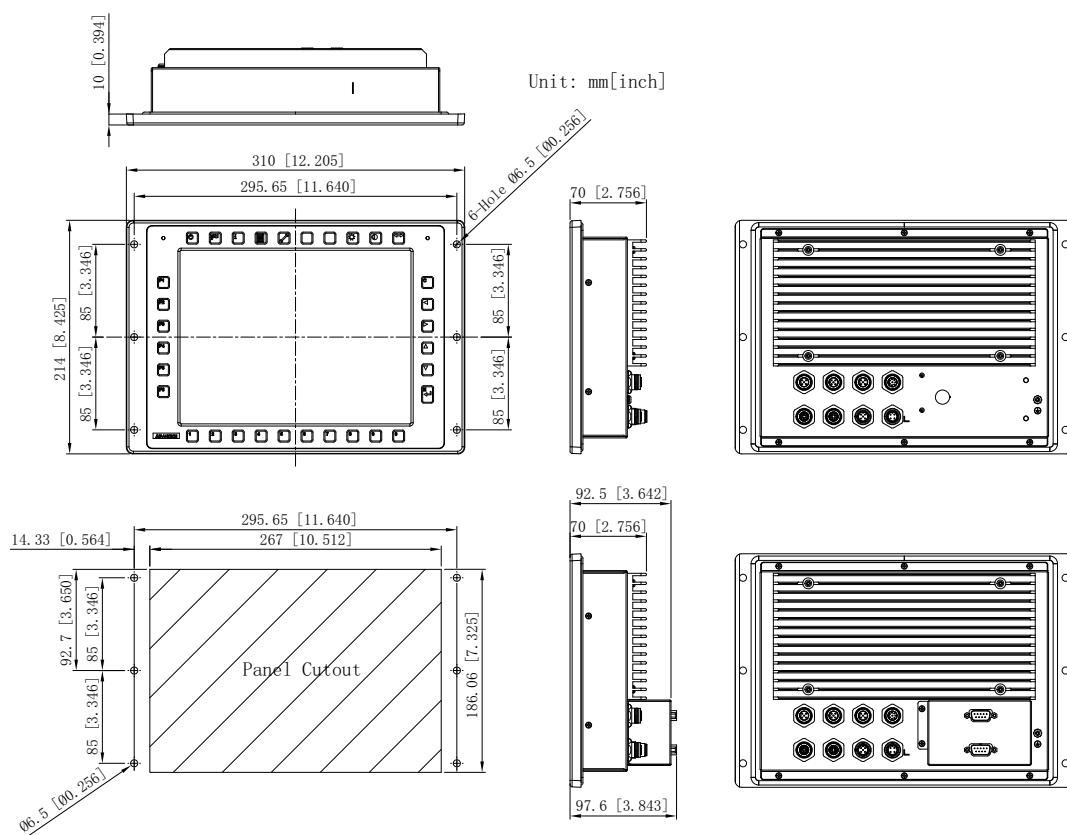


Figure 1.1 ITA-8100 Series Dimensions Diagram

■ ITA-8120

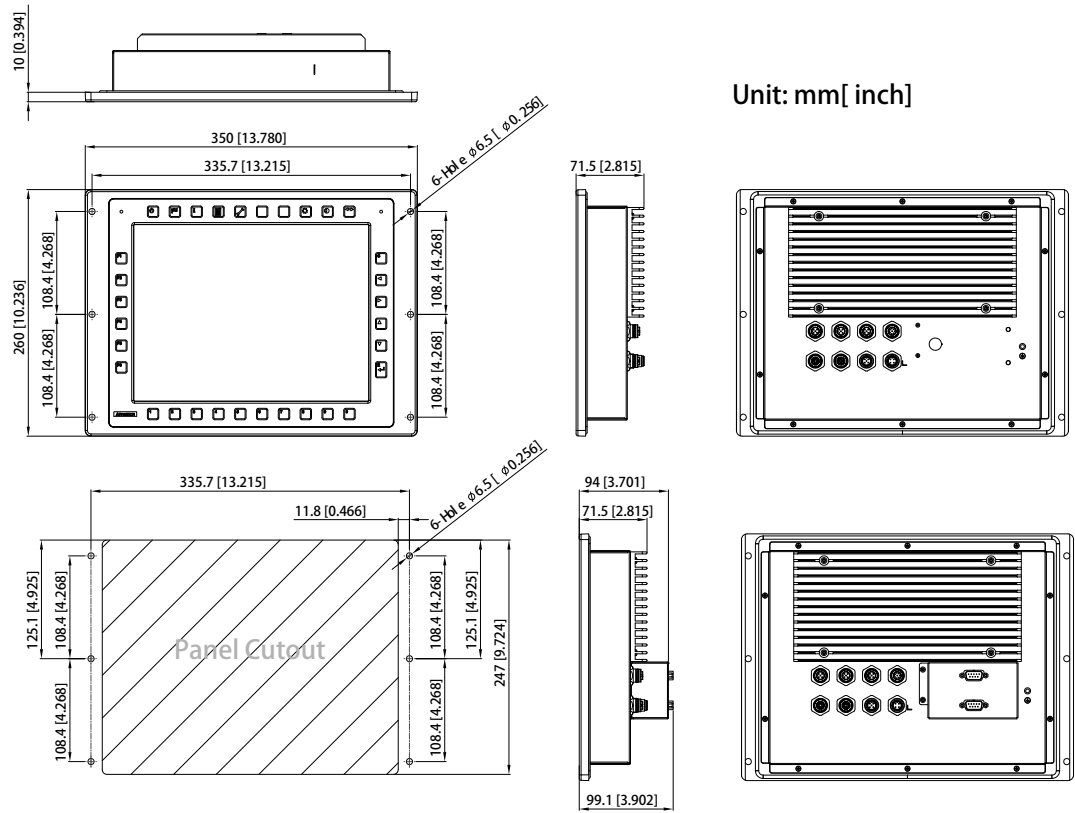


Figure 1.2 ITA-8120 Series Dimensions Diagram

Chapter 2

Connectors and Function Keys

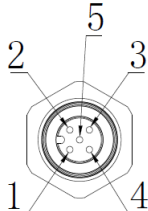
- Introduction
- I/O Connectors
- Bezel Key Mapping

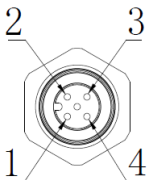
2.1 Introduction

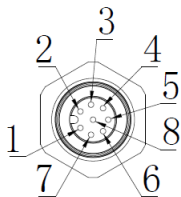
The following sections show the pin assignments for the I/O connectors and bezel key mapping to facilitate application integration.

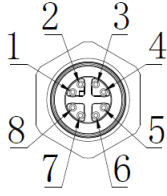
2.2 I/O Connectors

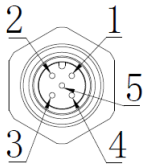


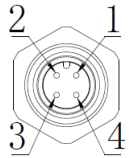
COM (RS-422/485)	Pin Number	Definition	Female
M12-A-5P-F	1	485-422_TX-	
	2	485-422_TX+	
	3	422_RX+	
	4	422_RX-	
	5	GND	

USB	Pin Number	Definition	Female
M12-A-4P-F	1	D-	
	2	+5V	
	3	D+	
	4	GND	

DIO	Pin Number	Definition	Female
M12-A-8P-F	1	Vcc	
	2	DI0	
	3	DI1	
	4	DI2	
	5	DI3	
	6	DI4	
	7	DO0	
	8	GND	

LAN	Pin Number	Definition	Female
M12-X-8P-F	1	LAN_MDIO+	
	2	LAN_MDIO-	
	3	LAN_MDIO1+	
	4	LAN_MDIO1-	
	5	LAN_MDIO3+	
	6	LAN_MDIO3-	
	7	LAN_MDIO2-	
	8	LAN_MDIO2+	

AUDIO	Pin Number	Definition	Male
M12-A-5P-M	1	Line Out_R	
	2	Line Out_L	
	3	MIC_R	
	4	MIC_L	
	5	Audio_GND	

POWER	Pin Number	Definition	Male
M12-A-4P-M	1	V-	
	2	V+	
	3	V+	
	4	V-	

2.3 Bezel Key Mapping

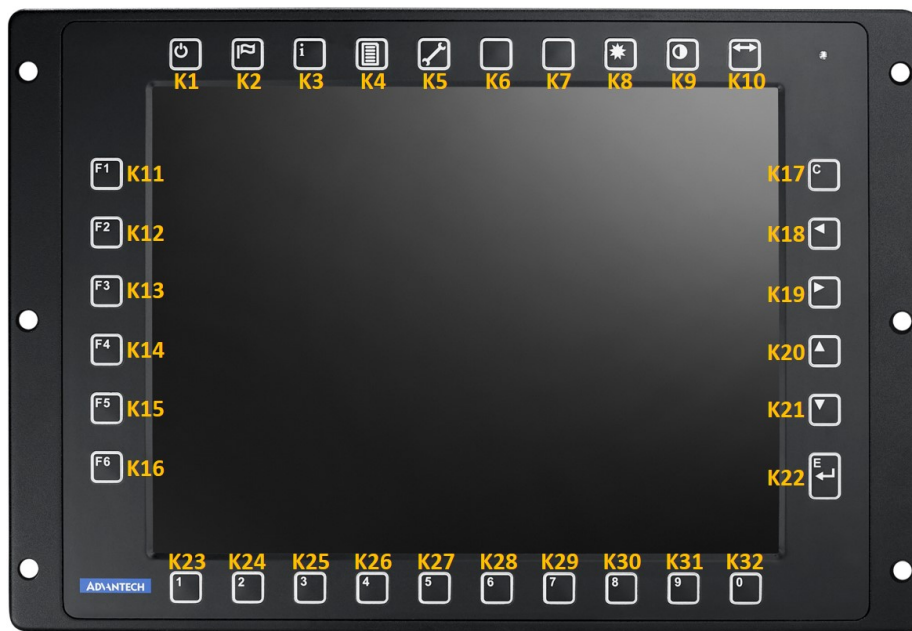


	Image	Key		Image	Key
K1		Backlight on/off; Reboot*	K17		ESC
K2		SHIFT F2	K18		LEFT
K3		SHIFT F3	K19		RIGHT
K4		SHIFT F4	K20		UP
K5		SHIFT F5	K21		DOWN
K6		SHIFT F6	K22		ENTER
K7		SHIFT F7	K23		1
K8		SHIFT F8	K24		2
K9		SHIFT F9	K25		3
K10		SHIFT F10	K26		4

K11		F1	K27		5
K12		F2	K28		6
K13		F3	K29		7
K14		F4	K30		8
K15		F5	K31		9
K16		F6	K32		0

*Press the power button (K1) for less than 1 second: Backlight on/off

*Press and hold the power button (K1) for 5 seconds: System reboot

Chapter 3

Firmware and BIOS Information

- DIO Setting Steps
- Light Sensor Enabled and Disabled
- Watchdog Sample Code

3.1 DIO Setting Steps

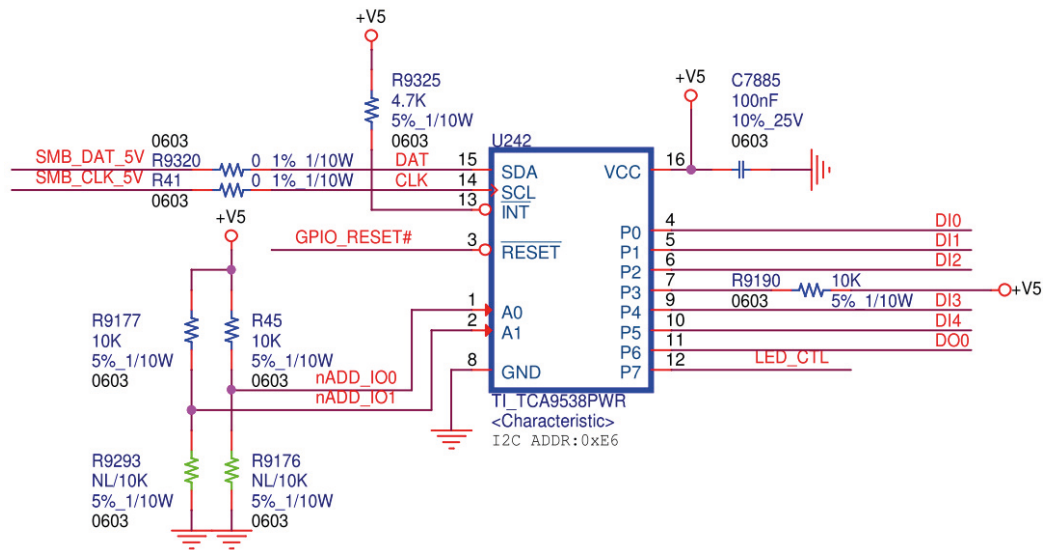


Table 3.1: DIO - Read DI0~4

Step	Action	Description
00	Wait IBF clear	0x29A, BIT1, = 0
01	Write 0xE7 to 0x29A	Send DIO command
02	Wait IBF clear	0x29A, BIT1, = 0
03	Write 0x00 to 0x299 port	Send Read DI command
04	Wait OBF set	0x29A, BIT0, = 1
05	Read 0x299 port	Read DATA from DI (BIT0, 1, 2, 4, 5)

Table 3.2: DIO – Write DO0 High

Step	Action	Description
00	Wait IBF clear	0x29A, BIT1, = 0
01	Write 0xE7 to 0x29A	Send DIO command
02	Wait IBF clear	0x29A, BIT1, = 0
03	Write 0x01 to 0x299 port	Send Write DO0 High

Table 3.3: DIO – Write DO0 Low

Step	Action	Description
00	Wait IBF clear	0x29A, BIT1, = 0
01	Write 0xE7 to 0x29A	Send DIO command
02	Wait IBF clear	0x29A, BIT1, = 0
03	Write 0x02 to 0x299 port	Send Write DO0 Low

Table 3.4: DIO – LED High

Step	Action	Description
00	Wait IBF clear	0x29A, BIT1, = 0
01	Write 0xE7 to 0x29A	Send DIO command
02	Wait IBF clear	0x29A, BIT1, = 0
03	Write 0x03 to 0x299 port	Send Write LED High

Table 3.5: DIO – LED Low

Step	Action	Description
00	Wait IBF clear	0x29A, BIT1, = 0
01	Write 0xE7 to 0x29A	Send DIO command
02	Wait IBF clear	0x29A, BIT1, = 0
03	Write 0x04 to 0x299 port	Send Write LED Low

3.2 Light Sensor Enabled and Disabled

3.2.1 Introduction

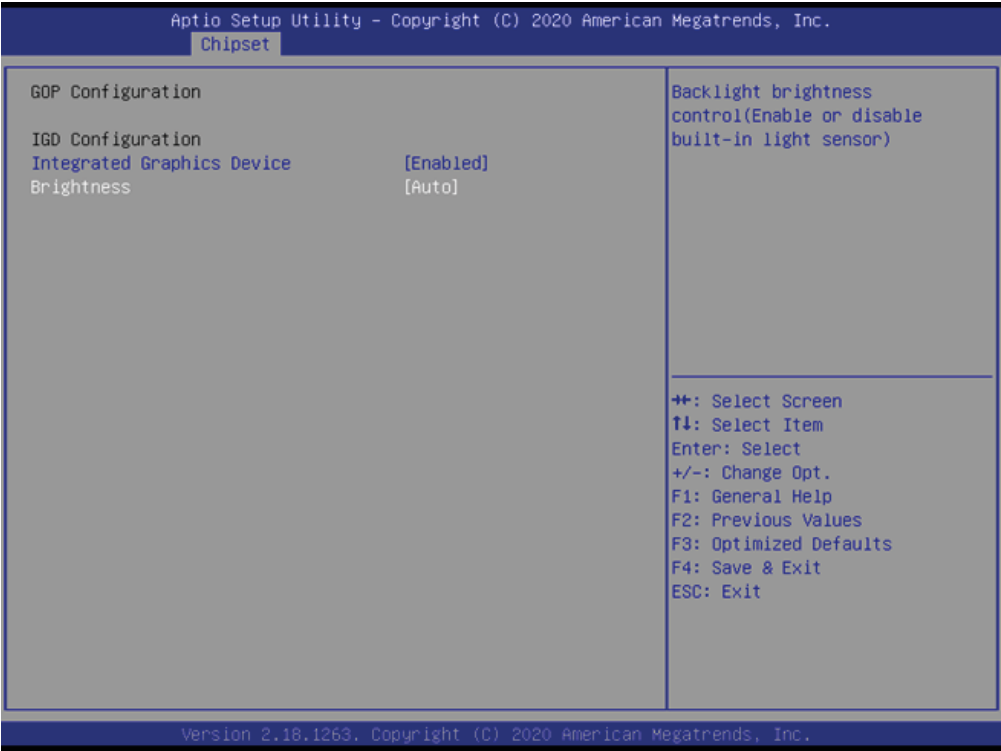
ITA-8100 and ITA-8120 features a built-in light sensor on the front panel. This Light sensor is enabled by default so that the backlight brightness is automatically changed according to intensity of the ambient light. The brightness can be manually adjusted by disabling the light sensor. It can be set or switched in the BIOS menu.

3.2.2 Disable/Enable Light Sensor

Enter 'Uncore Configuration' in BIOS menu under 'Chipset' section.

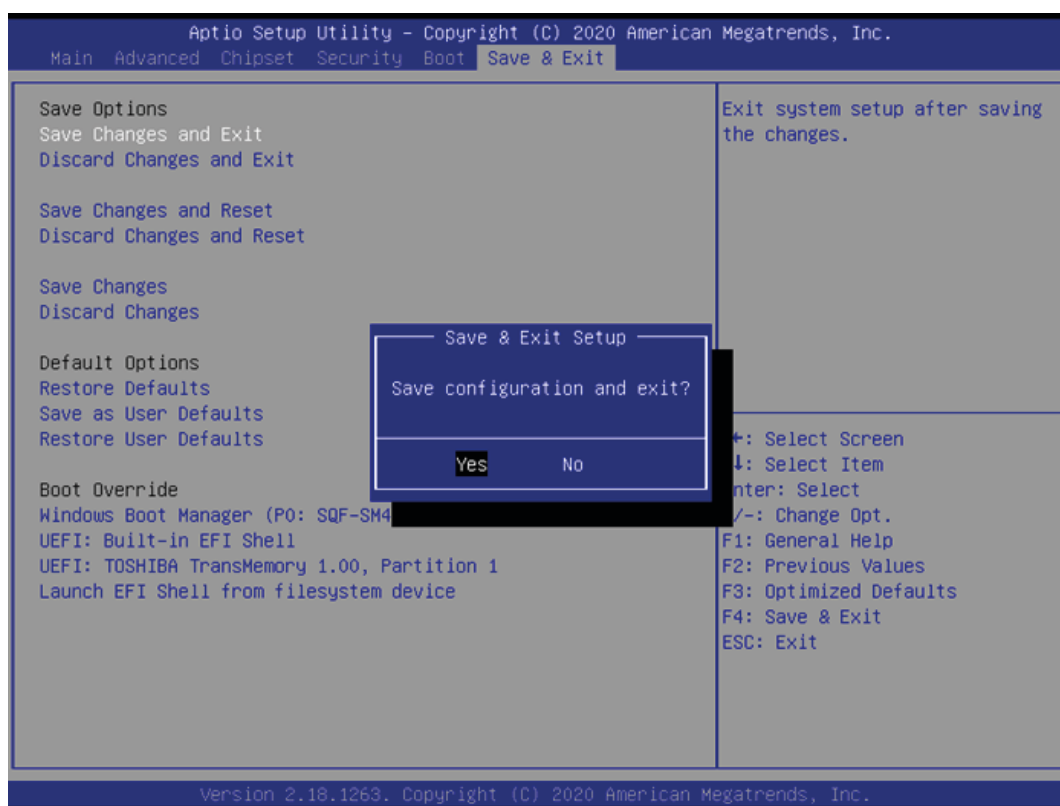


Inside, find 'Brightness' and set it to 'Auto' (enable light sensor) or 'Manual' (disable light sensor).





Save desired configuration and exit BIOS to automatically restart system.



3.3 Watchdog Sample Code

```
#include <cstdlib>
#include <sys/io.h>
#include <unistd.h>
#include <iostream>

using namespace std;

int OBF=0x01, IBF=0x02;

int wait_OBF(int Port)
{
    int icount;
    for(icount=0;icount<0xFF;icount++)
    {
        int iValue = inb(Port);

        if((iValue&OBF) == 0x01)
            return true;
        usleep(1000);
    }

    cout << "wait_OBF failed\n";
    cout.flush();
    return false;
}

int wait_IBF(int Port)
{
    int icount;
    for(icount=0;icount<0xFF;icount++)
    {
        int iValue = inb(Port);

        if((iValue&IBF) == 0x00)
            return true;
        usleep(1000);
    }

    cout << "wait_IBF failed\n";
    cout.flush();
    return false;
}

void DummyPort()
{
    int iRet = inb(0x299);
    wait_IBF(0x29A);
}
```

```
void SetWD()
{
    iopl(3);

    DummyPort();

    inb(0x299);
    wait_IBF(0x29A);
    outb(0x89, 0x29A);
    wait_IBF(0x29A);
    outb(0x5E, 0x299);
    wait_IBF(0x29A);
    outb(0x00, 0x299);
    wait_IBF(0x29A);
    outb(0x89, 0x29A);
    wait_IBF(0x29A);
    outb(0x5F, 0x299);
    wait_IBF(0x29A);
    outb(0x64, 0x299);
}

void StartWD()
{
    iopl(3);

    DummyPort();

    outb(0x89, 0x29A);
    wait_IBF(0x29A);
    outb(0x57, 0x299);
    wait_IBF(0x29A);
    outb(0x04, 0x299);
    wait_IBF(0x29A);
    outb(0x28, 0x29A);
}

void StopWD()
{
    iopl(3);

    DummyPort();

    outb(0x29, 0x29A);
    wait_IBF(0x29A);
}

int main(int argc, char** argv) {

    SetWD();

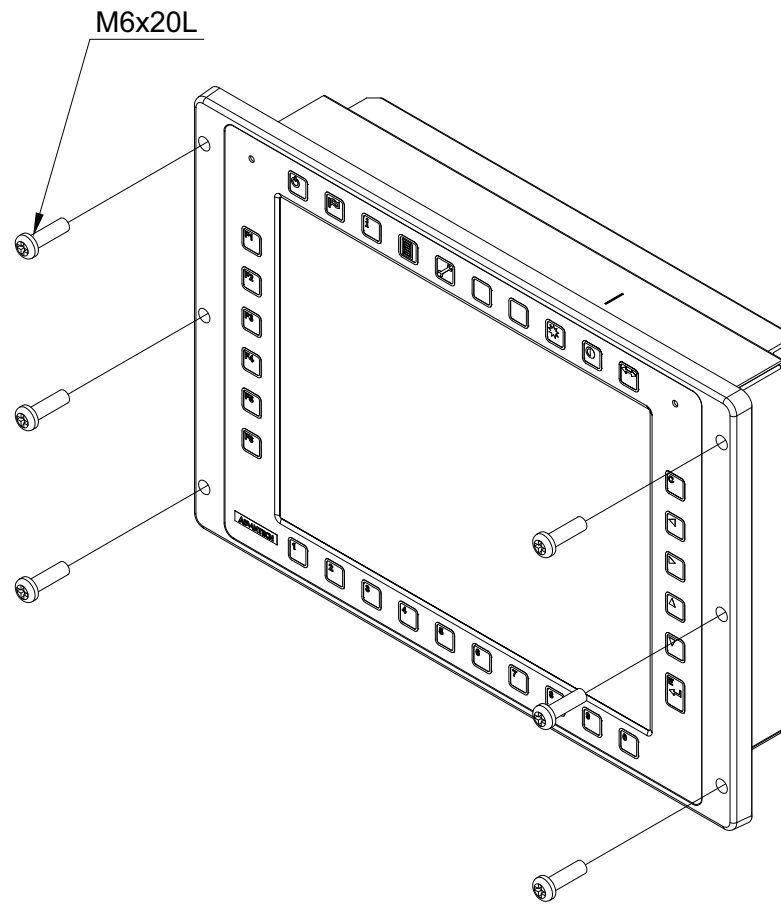
    while(1)
```

```
    {  
        StartWD();  
        usleep(5000000);  
        StopWD();  
    }  
    return 0;  
}
```

Appendix **A**

Panel Mounting

A.1 Panel Mounting



Appendix **B**

DC Power Connection

B.1 DC Power Connection

Caution! Only trained service personnel are authorized to install and remove the 24,48,72,110 V_{DC} power source, and make connections and disconnections between the V_{DC} power source and protective earthing.



The customer is responsible for ensuring that only trained service personnel install or remove the 24,48,72,110 V_{DC} power cable and grounded connection.

Note! 1. The DC power source for the equipment should be UL certified and meet the specifications outlined by the manufacturer.



2. Please use a jacketed power cable with 120V, 18 AWG or 6 AMP to connect the equipment to the DC power source.

Connect the Power Source

1. Turn off the equipment intended to be connected to the DC power source and turn off the power outlet socket.
2. Ensure the DC power source is connected to a grounded cable.
3. Connect the grounded cable (at least 18 AWG with a green and yellow grounding wire) to the equipment's protective grounded terminal.
4. Connect the signal cables to the equipment.
5. Connect the power cable to the equipment.
6. Ensure the correct polarity of the 24,48,72,110 V_{DC} connections: 24,48,72,110 V_{DC} is + and RTN is -.
7. Turn on the DC power source.

Disconnect the Power Source

1. Turn off the equipment and the DC power outlet.
2. Disconnect the power cable from the equipment.
3. Remove the signal cables from the connectors.
4. Remove the grounded cable from the equipment's protective grounded terminal.

B.2 Connexion Pour Source D'alimentation

Attention!



Seul le personnel de service qualifié est autorisé à installer et à retirer la source d'alimentation de 24,48,72 ou 110 volts cc, ainsi qu'à effectuer les connexions et déconnexions de la source d'alimentation à 24,48,72 ou 110 volts cc, et à la mise à la terre. Il incombe au client de s'assurer que seul un personnel de maintenance qualifié installe ou débranche le câble d'alimentation de 24,48,72 ou 110 volts et la connexion à la terre.

Remarque!



1. La source d'alimentation en CC pour l'alimentation de l'équipement fournie doit être une source d'alimentation certifiée UL, et conforme aux spécifications fournies par le fabricant.

2. Veuillez utiliser le câble d'alimentation gainé de 120 volts, 18 AWG ou 6 ampères pour connecter l'équipement et la source d'alimentation CC.

Pour connecter une source d'alimentation

1. Eteignez la source d'alimentation CC et l'équipement à connecter à cet appareil
2. Assurez-vous que le câble connecté à la source d'alimentation CC est bien mis à la terre
3. Connectez le câble de mise à la terre AWGen 18 min) : fil vert et jaune de la terre du bâtiment à la borne de protection mise à la terre de l'équipement.
4. Connectez les câbles de signal au produit.
5. Connectez le câble d'alimentation au produit.
6. Vérifiez que la polarité des connexions 24,48,72,110 Vcc est correcte : 24,48,72,110 Vcc :est le + et RTN est le - .
7. Allumez la source d'alimentation CC.

Pour déconnecter la source d'alimentation

1. Eteignez la source d'alimentation CC et l'équipement.
2. Débranchez le câble d'alimentation de l'équipement.
3. Retirez les câbles de signal des connecteurs.
4. Retirez le câble de mise à la terre de la borne de protection de mise à la terre de l'équipement.



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