DATALOGIC

Matrix 120™

QUICK REFERENCE GUIDE

SUPPORT THROUGH THE WEBSITE

Datalogic provides several services as well as technical support through its website. Log on to www.datalogic.com.

For quick access, from the home page click on the search icon 🔍 , and type in the name of the product you're looking for. This allows you access to download Data Sheets, Manuals, Software & Utilities, and Drawings.

Hover over the Support & Service menu for access to Services and Technical Support.

INSTALLATION PROCEDURE

1. **Using a 2.5 mm hex key, set the Focus Adjustment Screw to one of the three pre-calibrated distances according to your application.**
2. **Physically mount the Matrix 120 reader.**
3. **Make the necessary electrical connections.**
4. **Configure the reader using the X-PRESS interface (AIM, SETUP, LEARN and TEST for simple configuration) or the DL.CODE software configuration program (complete configuration).**
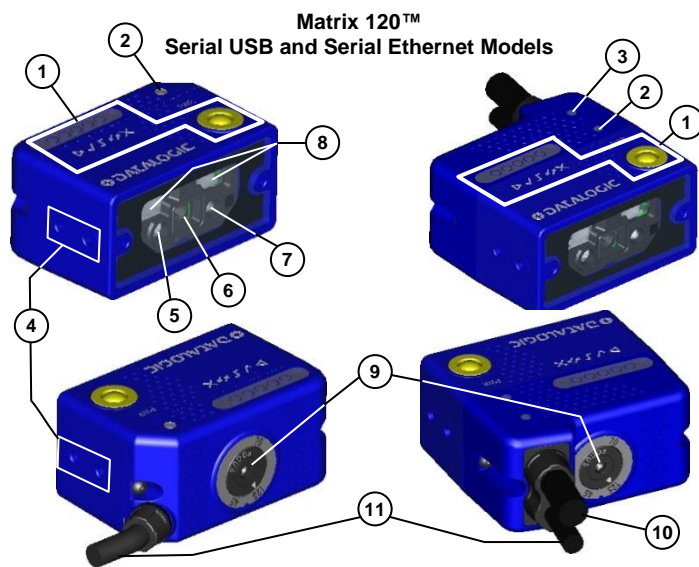
HMI X-PRESS™ INTERFACE

In normal operating mode the colors and meaning of the five LEDs are illustrated in the following table:

READY (green)	indicates the device is ready to operate.
GOOD (green)	confirms successful reading.
TRIGGER (yellow)	indicates the status of the reading phase.
COM (yellow)	indicates active communication on main serial port.
STATUS (red)	indicates a NO READ result.

During the reader startup (reset or restart phase), all the LEDs blink for one second.

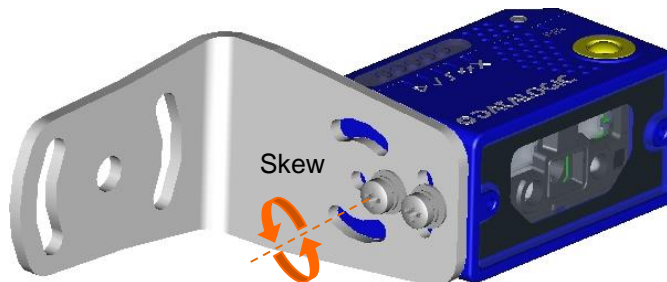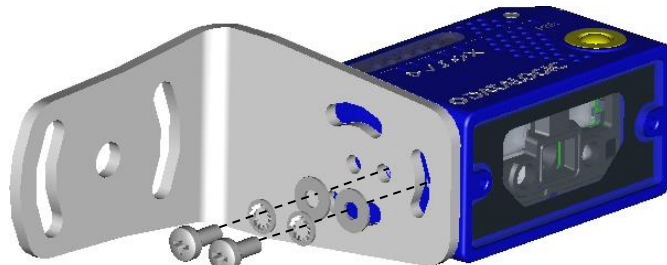The single push button gives immediate access to the following relevant functions:

↗	Test Mode with bar graph visualization to check static reading performance.
↱	Focus (Aim) turns on the laser LED to aim the reader at the target. **The target should be placed 8 mm to the left and centered vertically with respect to the aiming pattern (cross).**
✓	Setup to self-optimize and auto-configure photometry parameters.
▷	Learn to self-detect and auto-configure for reading an unknown barcode (by type and length). Only one symbology type can be saved using this method. Performing Autolearn on a second symbology will overwrite the first one.

Matrix 120™ Serial USB and Serial Ethernet Models

General View

① HMI X-PRESS™ Interface
② Power On LED
③ Ethernet Connection LED
④ Mounting Holes (4)
⑤ Aiming System Laser Source
⑥ Lens
⑦ Good Read LED (green)
⑧ Internal Illuminators
⑨ Focus Adjustment Screw
⑩ Ethernet Cable
⑪ Power - Serial - I/O Cable

Mounting

1. To mount the Matrix 120, use the mounting bracket to obtain the most suitable position for the reader. Common mounting configurations are shown in the figures below.

Skew

Assure a 10° – 15° Skew Angle on the code to avoid direct reflections.

Electrical Connections

Ethernet + Serial Models Using Ethernet Interface

All Models Using Main Serial Port

Serial + USB Models Using USB Port

External Power only for I/O Accessories
5-30 Vdc for inputs
5 Vdc for outputs

Serial + USB Models Using USB Port + I/O

CAB-1011   CAB-1021   CAB-1051
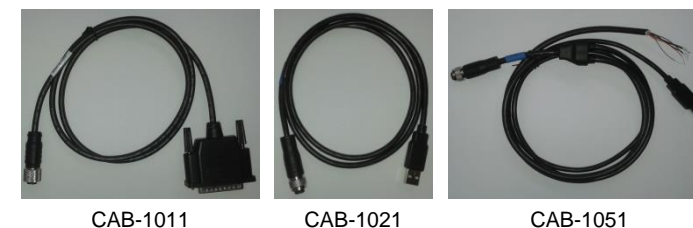
I/O Connections

I/O Using CAB-1011 to CBX:

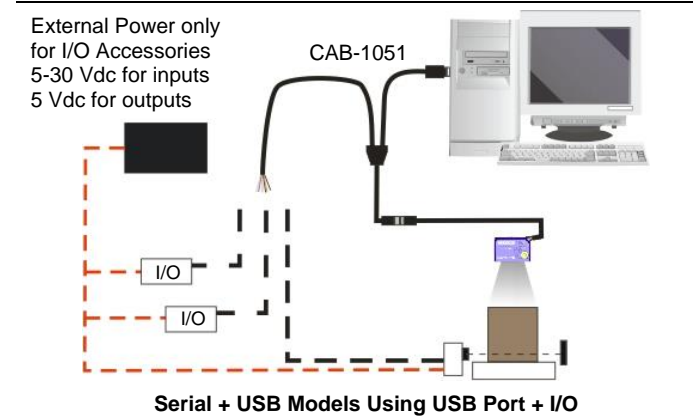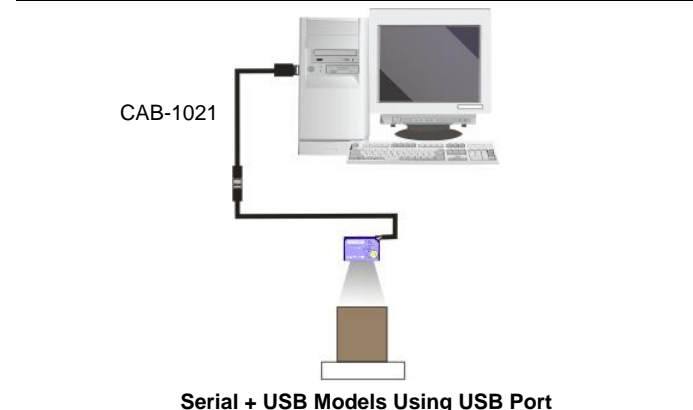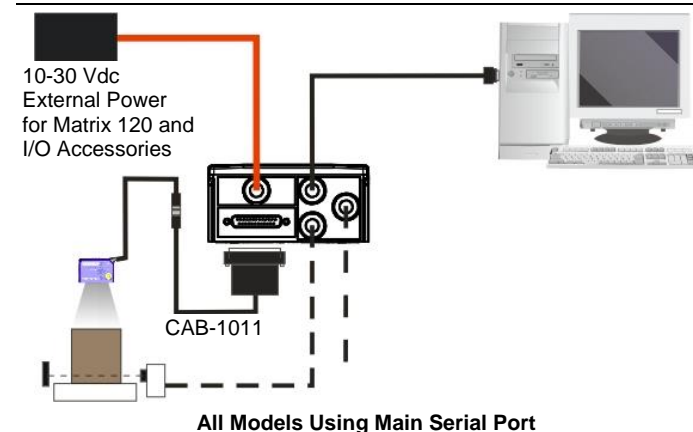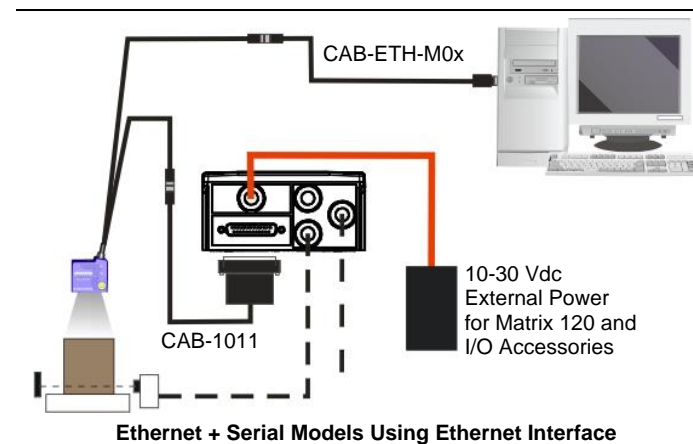⚠️ **CAUTION:** When Matrix 120 is connected to the CBX connection box through CAB-1011, **Inputs** and **Outputs** become opto-isolated and maintain the polarity significance of the CBX signals. To function correctly, they all require setting the respective Line Type configuration parameters to NPN. The hardware connection to the CBX can be either NPN or PNP.

The electrical features of both inputs at the CBX are:
V_{AB} = 30 Vdc max.
I_{IN} = 12 mA (CAB-1011) + 12 mA (CBX) max.

The following connections refer to Datalogic sensors.

NPN   PNP
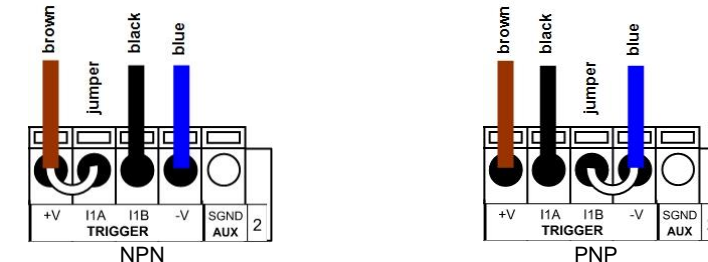
NPN and PNP Trigger Input Wiring to CBX

The electrical features of the two outputs at the CBX are the following:
V_{CE} = 30 Vdc max.
I_{CE} = 40 mA continuous max.; 130 mA pulsed max.

NPN/Open Collector   PNP/Open Emitter
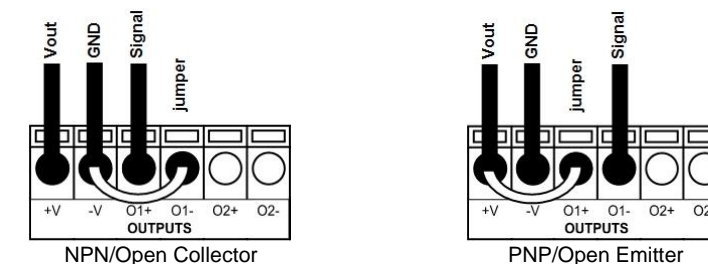
NPN and PNP Output Wiring to CBX
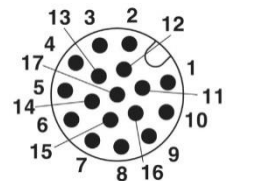
I/O Using CAB-1051:

⚠️ **CAUTION:** If **output** devices are powered externally (separate from Matrix 120 power), it is always advised to maintain the same voltage levels used for the Matrix 120 device.

Inputs	Outputs
V_{ext} = 5-30 Vdc max I_{IN} = 3.5 mA max	V_{ext} = 5 Vdc max I_{CE} = 100 mA max
	V_{out} = 3.3 Vdc max I_{out} = 50 mA max
CAB-1051 Input 1 (Trigger) = orange Input 2 = grey GND = black	CAB-1051 Output 1 = purple Output 2 = red/white GND = black

Connector Pinouts

Power - Serial - IO	Ethernet
(connector diagram: 13 1 2 12, 4 3, 17 11, 5 1, 14 11, 6 10, 15 9, 7 8 16)	Pin 1 = TX+
	Pin 2 = RX+
	Pin 3 = TX-
	Pin 4 = RX-
	Use Cat 5e or superior cables.

17-pin	Name	Function
9**	O1	Output 1 (referenced to GND)
8**	O2	Output 2 (referenced to GND)
6	IN1	External Trigger (referenced to GND)
13	IN2	Input Signal 2 (referenced to GND)
7	USB+	USB Data + (only for USB models)
15	USB-	USB Data - (only for USB models)
1	Vdc	Power Supply Input Voltage +
2	GND	Power Supply Input Voltage -
5	-	Reserved
3, 4, 14, 16	NC	not connected
Shield		Cable shield connected to chassis and 17-pin connector shell

	RS232 Main Serial Interface	RS422 FD
17	TX	TX+
11	RX	*** RX+
12	-	TX-
10	-	*** RX-

** referenced to GND; Outputs become opto-isolated and polarity sensitive when connected through the CBX connection box. See Reference Manual for connection details.

*** do not leave floating. See Reference Manual for connection details.

Focus and Positioning

The Matrix 120 models are factory calibrated at three focus positions (**45, 70 and 125 mm for WVGA models; 45, 80 and 125 mm for MP models**). Using a 2.5 mm Hex key (Allen wrench), rotate the Focus Adjustment Screw at the back of the reader to one of these three positions for your application.

CAUTION: Do not rotate the Focus Adjustment Screw beyond the focus scale limits otherwise damage can occur to the focus mechanism.

The following tables show the reading ranges at the three focus positions for Code 128 (1D) and Data Matrix (2D) 10 mil resolution codes:

WVGA Models (Matrix 120 210-xxx)

Focus Position	Horizontal FOV	Reading Range (DOF)	
		1D	2D
45	38 mm / 1.5 in	30 – 80 mm / 1.2 – 3.1 in	25 - 70 mm / 1.0 – 2.8 in
70	56 mm / 2.2 in	60 – 125 mm / 2.4 – 4.9 in	45 – 100 mm / 1.8 – 3.9 in
125	95 mm / 3.7 in	95 – 155 mm / 3.7 – 6.1 in	65 – 120 mm / 2.6 – 4.7 in

MP Models (Matrix 120 310-xxx)

Focus Position	Horizontal FOV	Reading Range (DOF)	
		1D	2D
45	40 mm / 1.6 in	30 – 90 mm / 1.2 – 3.5 in	30 - 80 mm / 1.2 – 3.1 in
80	67 mm / 2.6 in	60 – 130 mm / 2.4 – 5.1 in	60 – 125 mm / 2.4 – 4.9 in
125	100 mm / 3.9 in	100 – 190 mm / 3.9 – 7.5 in	110 – 165 mm / 4.3 – 6.5 in

WA Models without Polarizer (Matrix 120 311-xx0)

Focus Position	Horizontal FOV	Reading Range (DOF)	
		1D	2D
45	52 mm / 2.0 in	25 – 90 mm / 1.0 – 3.5 in	30 - 65 mm / 1.2 – 2.6 in
80	86 mm / 3.4 in	65 – 145 mm / 2.6 – 5.7 in	55 – 105 mm / 2.2 – 4.1 in
125	130 mm / 5.1 in	105 – 180 mm / 4.1 – 7.1 in	80 – 125 mm / 3.1 – 4.9 in

The focus range is continuous to provide fine-tuning for your application.

CONFIGURATION

Installing DL.CODE

1. On the PC that will be used for configuration, (running Windows 7, 8, or 10), download the DL.CODE mini-DVD .zip file. Extract the files maintaining the folder structure and run the **start.hta** file to access the installation pop-up. Click on the **Install DL.CODE** link to run the installation program and follow the installation procedure.

2. When the installation is complete the DL.CODE entry is created in the Start>Programs bar under "Datalogic" as well as a desktop icon. Double-click the desktop icon to run it.

3. Follow the Matrix 120 Reference Manual to configure:
   - Image lighting and code definition (Automatic or Advanced Setup)
   - Reading Phase and Communication Channel Selection
   - Data Collection Type
   - Data Formatting
   - Digital Output(s)

TECHNICAL FEATURES

ELECTRICAL FEATURES

Power	
Supply Voltage	5 to 30 Vdc (10 to 30 Vdc with CBX)
Consumption	0.4 to 0.1 A Max.
Communication Interfaces	
Main RS232 or RS422 FD	2400 to 115200 bit/s
USB	USB 2.0 Hi-Speed
Ethernet[1]	10/100 Mbit/s
Inputs:	short-circuit protected (Opto-coupled and polarity insensitive when connected through CBX)
Outputs:	short-circuit protected (Opto-coupled when connected through CBX)

OPTICAL FEATURES (see Reference Manual for details)

PHYSICAL FEATURES

PHYSICAL FEATURES	Serial + USB	Serial + Ethernet
Dimensions mm (inch)	45.4 x 31.1 x 23.5 (1.8 x 1.2 x 1)	45.4 x 48.5 x 23.5 (1.8 x 1.9 x 1)
Weight grams (ounces)	117 (4.1) with cable	200 (7.1) with cable
Material	Aluminium	Aluminium

ENVIRONMENTAL FEATURES

Operating Temperature[2]	0 to 45 °C (32 to 113 °F)
Storage Temperature	-20 to 70 °C (-4 to 158 °F)
Max. Humidity	90% non-condensing
Vibration Resistance EN 60068-2-6	14 mm @ 2 to 10 Hz; 1.5 mm @ 13 to 55 Hz; 2 g @ 70 to 500 Hz; 2 hours on each axis
Shock Resistance EN 60068-2-27	30g; 11 ms; 3 shocks up and 3 down on each axis
Bump Resistance EN 60068-2-29	30g; 6 ms; 5000 bumps up and 5000 down on each axis
Protection Class EN 60529	IP65

USER INTERFACE

LED Indicators	Power; Ready, Good, Trigger, Com, Status; Ethernet Network; Green Spot; (see Reference Manual for other LEDs)
Other	X-PRESS™ Keypad Button (configurable via DL.CODE™), Beeper

---

SOFTWARE FEATURES

SOFTWARE FEATURES

Readable Code Symbologies

1D and stacked		2D	POSTAL	Digimarc Barcode
• PDF417 Standard and Micro PDF417	• Codabar	• Data Matrix ECC 200 (Standard, GS1 and Direct Marking)	• Australia Post	DWCODE™ *
• Code 128 (GS1-128)	• Code 93		• Royal Mail 4 State Customer	
• Code 39 (Standard and Full ASCII)	• Pharmacode	• QR Code (Standard and Direct Marking)	• Kix Code	
• Code 32	• EAN-8/13 - UPC-A/E (including Addon 2 and Addon 5)		• Japan Post	
• MSI	• GS1 DataBar Family	• Micro QR Code	• PLANET	
• Standard 2 of 5	• Composite Symbologies		• POSTNET	
• Matrix 2 of 5		• MAXICODE	• POSTNET (+BB)	
• Interleaved 2 of 5		• Aztec Code	• Intelligent Mail	
			• Swedish Post	

Operating Mode	CONTINUOUS, ONE SHOT, PHASE MODE
Configuration Methods	X-PRESS™ Human Machine Interface Windows-based SW (DL.CODE™) via Ethernet or Serial Interface Host Mode Programming sequences sent over Serial or Ethernet TCP interfaces
Parameter Storage	Permanent memory (Flash)

*DWCODE models available

PATENTS

See www.patents.datalogic.com for patent list.

This product is covered by one or more of the following patents:

Matrix 120™

Design patents: EP003042845; EP003074079

Utility patents: EP0996284B1; EP0999514B1; EP1014292B1; EP1128315B1; EP1172756B1; EP1396811B1; EP1413971B1; EP1804089B1; EP2315156B1; EP2517148B1; EP2649555B1; JP4435343B2; JP4571258B2; JP5192390B2; US6512218; US6616039; US6808114; US6877664; US6997385; US7053954; US7387246; US8058600; US8113430; US8368000; US8888003; US8915443; US9268982; US9430689; ZL200680050007.8.

COMPLIANCE

Only connect Ethernet and dataport connections to a network which has routing only within the plant or building and no routing outside the plant or building.

EMC COMPLIANCE

In order to meet the EMC requirements:
- connect reader chassis to the plant earth ground by means of a flat copper braid shorter than 100 mm;
- connect pin "Earth" of the CBX connection box to a good Earth Ground;

POWER SUPPLY

This product is intended to be installed by Qualified Personnel only.

This product is intended to be connected to a UL Listed Computer (LPS or "Class 2") which supplies power directly to the reader or a UL Listed Direct Plug-in Power Unit marked LPS or "Class 2".

EAC COMPLIANCE

Customs Union:
The CU Conformity certification has been achieved; this allows the Product to bear the Eurasian mark of conformity.

LED SAFETY

LED emission according to EN 62471.

LASER SAFETY

All Matrix 120s contain one aiming Laser source used to position the reader.

These products conform to the applicable requirements of IEC 60825-1 and comply with 21 CFR 1040.10 except for deviations pursuant to Laser Notice N° 50, date June 24, 2007. This product is classified as a Class 1M laser product according to IEC 60825-1 regulations.

WARNING: Use of controls or adjustments or performance of procedures other than those specified herein may result in exposure to hazardous visible laser light.

LASER RADIATION DO NOT VIEW DIRECTLY WITH OPTICAL INSTRUMENTS CLASS 1M LASER PRODUCT

Disconnect the power supply when opening the device during maintenance or installation to avoid exposure to hazardous laser light. The laser beam can be switched on or off through a software command.

CE COMPLIANCE

CE marking states the compliance of the product with essential requirements listed in the applicable European directive. Since the directives and applicable standards are subject to continuous updates, and since Datalogic promptly adopts these updates, therefore the EU declaration of conformity is a living document. The EU declaration of conformity is available for competent authorities and customers through Datalogic commercial reference contacts. Since April 20th, 2016 the main European directives applicable to Datalogic products require inclusion of an adequate analysis and assessment of the risk(s). This evaluation was carried out in relation to the applicable points of the standards listed in the Declaration of Conformity. Datalogic products are mainly designed for integration purposes into more complex systems. For this reason, it is under the responsibility of the system integrator to do a new risk assessment regarding the final installation.

Warning

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

FCC COMPLIANCE

Modifications or changes to this equipment without the expressed written approval of Datalogic could void the authority to use the equipment.

This device complies with PART 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference which may cause undesired operation.

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 which case the user will be required to correct the interference at his own expense.

LEGAL NOTICES