FIFE GUIDING SOLUTIONS

MAXCESS®

FIFE

DST-1 Web Guiding Sensor with Operator Interface

User Manual

EN

MI 2-311 1 E

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1.0 Introduction

1.1 About these operating instructions

Periodically there will be updates to this manual. The latest version is available on our website or by calling your regional office listed on the back page of this publication.

The DST-1 Web Guiding Sensor with Operator Interface must not be installed or used in a machine or system which does not comply with the machinery directive 2006/42/EC.

The DST-1 was designed and manufactured to be installed as Partly Completed Machinery into a machine or partly completed machine.

The instructions must be read and used by all persons who have the responsibility of installing and maintaining the DST-1.

These instructions must be retained and incorporated in the technical documentation for the machine or partly completed machinery into which the DST-1 is installed.

CE marking

The DST-1 is marked with the CE sign according to the EMC directive 2014/30/EC.

Conventions used in this manual

All dimensions and specifications are shown in the format mm [inches] unless specified otherwise.

Language

These are the original instructions, written in English.

1.2 Product overview

The DST-1web guiding sensor is a smart sensor product, packaged with a powerful and simple to use operator interface.

The DST-1 sensing element is based on a wide angle, far-looking NIR (Near Infra-Red) digital image sensor.

The web guiding sensor can drive two independent outputs, producing edge or line tracking signals, web center or web width, near edge or far edge, by processing up to four independent regions of interest in the guided material.

The DST-1 web guiding sensor is capable of guiding variety of web materials—from opaque to clear, from reflective to an irregular mesh, a variety of perforated and tabbed edges, and other challenging materials—by recognizing an edge or line, or by optional center guiding.

The sensor OI offers a list of built-in functions for diagnostic, testing and calibration.

The web guiding sensor is designed for continuous use in IP54 environment.

1.3 Model number

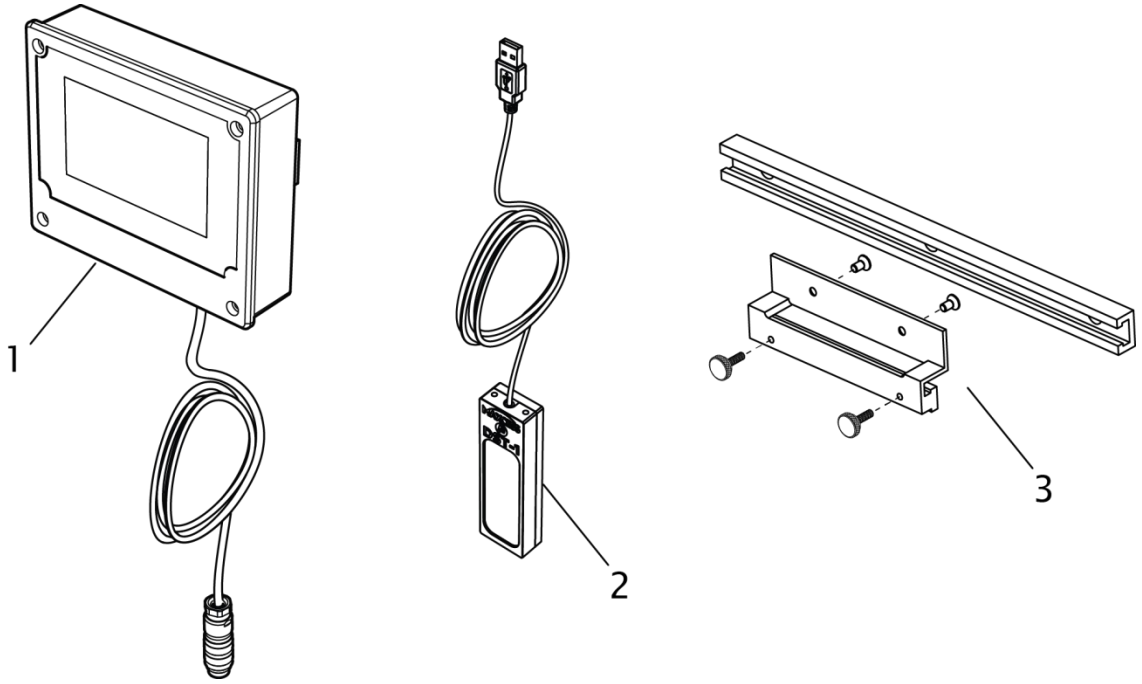
The model number and the serial number are shown on the enclosure.

Available models
User Manual

1.4 Serial number

Serial Number format is MMDDYYNNNL
MM = month
DD = day
YY = last two digits of the year
NNN = a sequence number
L = manufacturing location

1.5 DST-1 components



1 - DST-1 Operator interface
2 - DST-1 Sensing element
3 - DST-1 Sensing element mounting bracket kit

Figure 1. Component identification

1.6 Ordering information

Item	Part number	Drawing (reference)
DST-1 Sensor (complete unit)	290007510	225799
DST-1 Operator interface	290007404	225698
DST-1 Sensing element	290007384	225653
DST-1 Sensing element mounting bracket kit	FIFE-500: 29L22577410X FIFE-500XL: 29L22577420X	225774
Not shown		
Wall mount adapter kit (see page 12)	290007415	225554
Panel mount adapter kit (see page 13)	290009991	226484

2.0 Safety

2.1 Instructions for use

To ensure safe and problem free installation of the DST-1, it must be properly transported and stored, professionally installed and placed in operation. Proper operation and maintenance will ensure a long service life of the device. Only persons who are acquainted with the installation, commissioning, operation and maintenance of the system and who possess the necessary qualifications for their activities may work on the DST-1.

Note: The safety information may not be comprehensive.

Please note the following:

- The content of these operating instructions
- Any safety instructions on the device
- The machine manufacturer's specifications
- All national, state, and local requirements for installation, accident prevention and environmental protection

2.2 Symbols used

The following safety identification symbols may be used in these operating instructions.

	WARNING/CAUTION – General danger or important note Reference to general hazards that may result in bodily injuries or damage to device or material.
	WARNING/CAUTION – Danger due to crushing Reference to danger of injury caused by crushing.
	WARNING/CAUTION – Danger due to cutting Reference to danger of injury caused by cutting.
	WARNING/CAUTION – Danger due to voltage, electric shock Reference to danger of injury caused by electric shock due to voltage.
	WARNING/CAUTION – Danger due to hot surfaces Reference to risk of injury caused by burning.

2.3 Basic safety information

Proper use

The DST-1 Web Guiding Sensor with Operator Interface is intended to be used on machines or systems to aid in the guiding of a variety of web materials.

For indoor operation, see environmental specifications on page 59.

Improper use

- Operation outside the technical specifications
- Operation in an Ex-area or intrinsically safe area.
- Outdoor operation.
- Any other use than the proper use shall be deemed inappropriate.

Installation and commissioning

- Any DST-1 that is damaged must not be installed or put into operation.
- Only perform installation, maintenance or repair tasks on the DST-1 when the machine into which it has been installed has been stopped and is secured from being turned on.
- Only perform installation, maintenance or repair tasks on the DST-1 when there is no electrical power in the system.
- The DST-1must be securely mounted before being placed in operation.
- Only replacement parts obtained from Maxcess may be used.
- No modifications may be made to the DST-1.
- Do not place electrical cables under mechanical strain.

WARNING – Death or injury can result from static electric shocks.

Moving webs of material can produce large static voltage potentials. Protect against electric shocks by ensuring that the DST-1 is properly connected to a Maxcess web guiding controller and that the controller is properly grounded via the PE circuit of the building or machine.

Basic safety information continued

WARNING – Death or injury can result from unexpected movement of the machine into which the DST-1 is installed.

Protect against unexpected movement by removing electrical power from the DST-1 and the machine into which the DST-1 is being installed.

Operation

None, as tasks from the operator are generally not required.

Maintenance and repair

WARNING – Death or injury can result from unexpected movement of the machine into which the DST-1 is installed.

Protect against unexpected movement by removing electrical power from the DST-1 and the machine into which the DST-1 is installed.

WARNING – Danger of injury from crushing.

Maintenance and repair tasks on the DST-1 must be performed only when the machine into which it has been installed has been stopped and has been secured from being turned on again.

Decommissioning

The DST-1 must be disposed of in accordance with all the applicable national, state and local regulations.

3.0 Installation

Use shielded cable for all cables except for power cable.

3.1 Product dimensions

Units are in millimeters [inches]

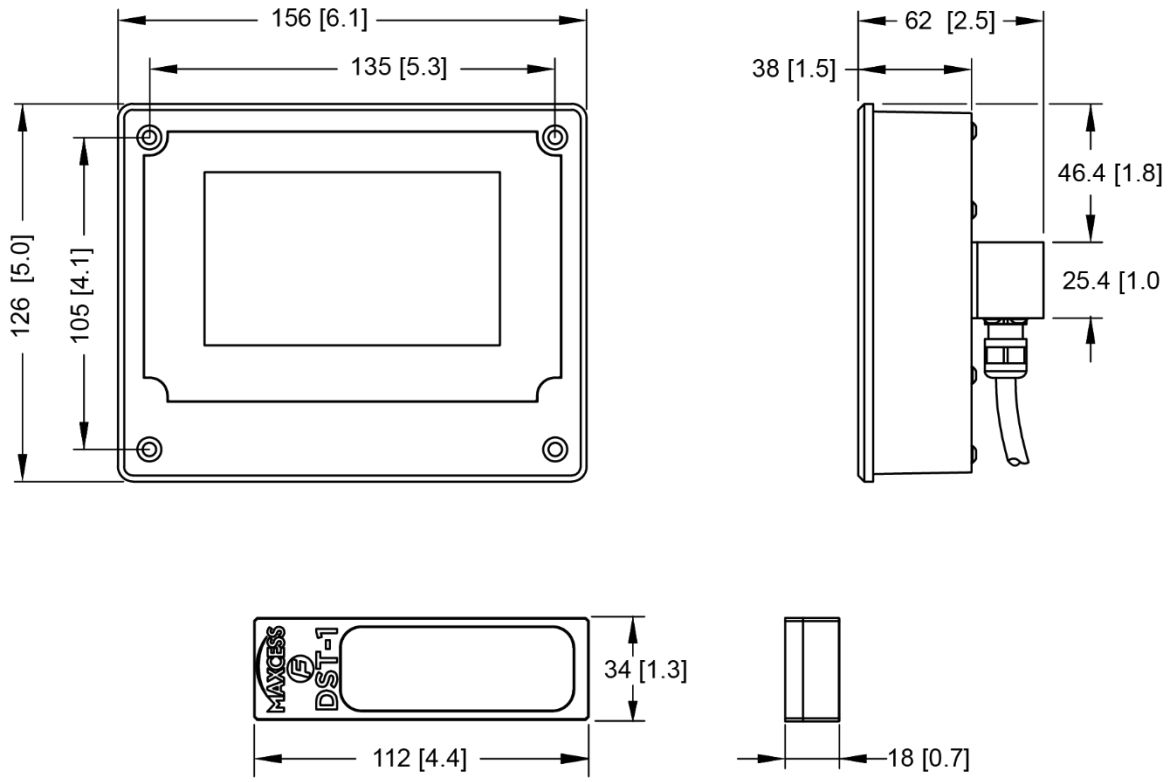
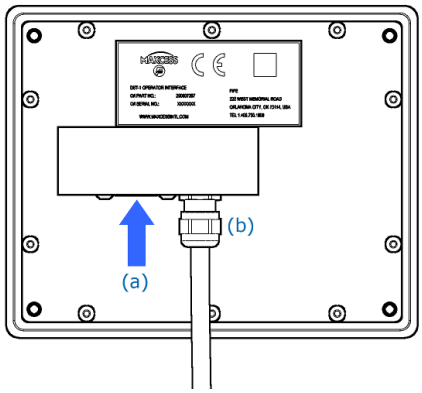


Figure 2. Dimensions: DST-1 sensing element and operator interface



(a) USB port: DST-1 sensing element or memory stick
(b) Power/signal cable

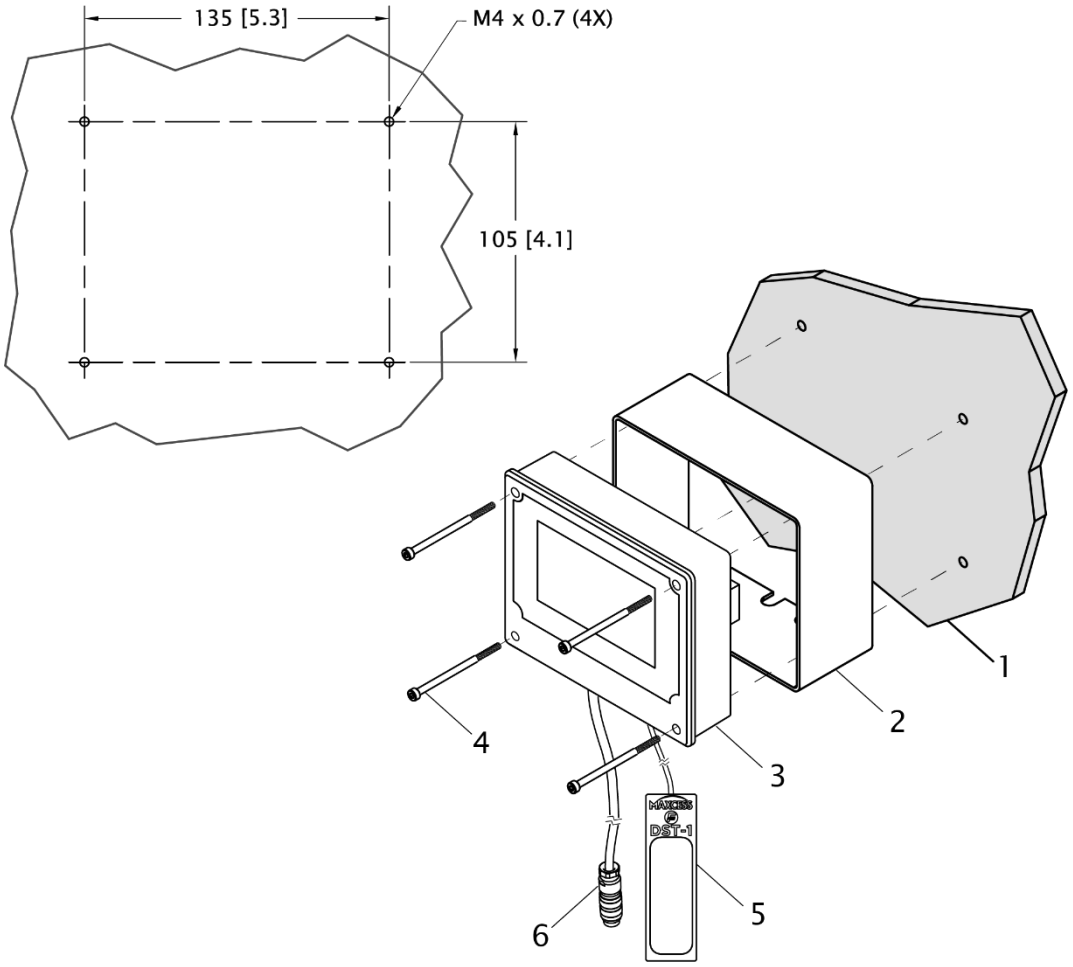
Figure 3. Cable and USB connections

3.2 Mounting the DST-1 operator interface

3.2.1 Wall mount

CAUTION – Never place electrical cables under mechanical strain. Always provide mechanical support of wiring with either clamps or flexible or rigid conduit.

Units are in millimeters [inches].



1 – Wall (or mounting surface)
2 – Operator interface wall mount adapter*
3 – DST-1 operator interface
4 – Soc hd cap scr, SS M4x70, 4 each*
5 – DST-1 sensing element with cable**
6 – Output cable assembly**

Figure 4. Operator interface wall mount installation

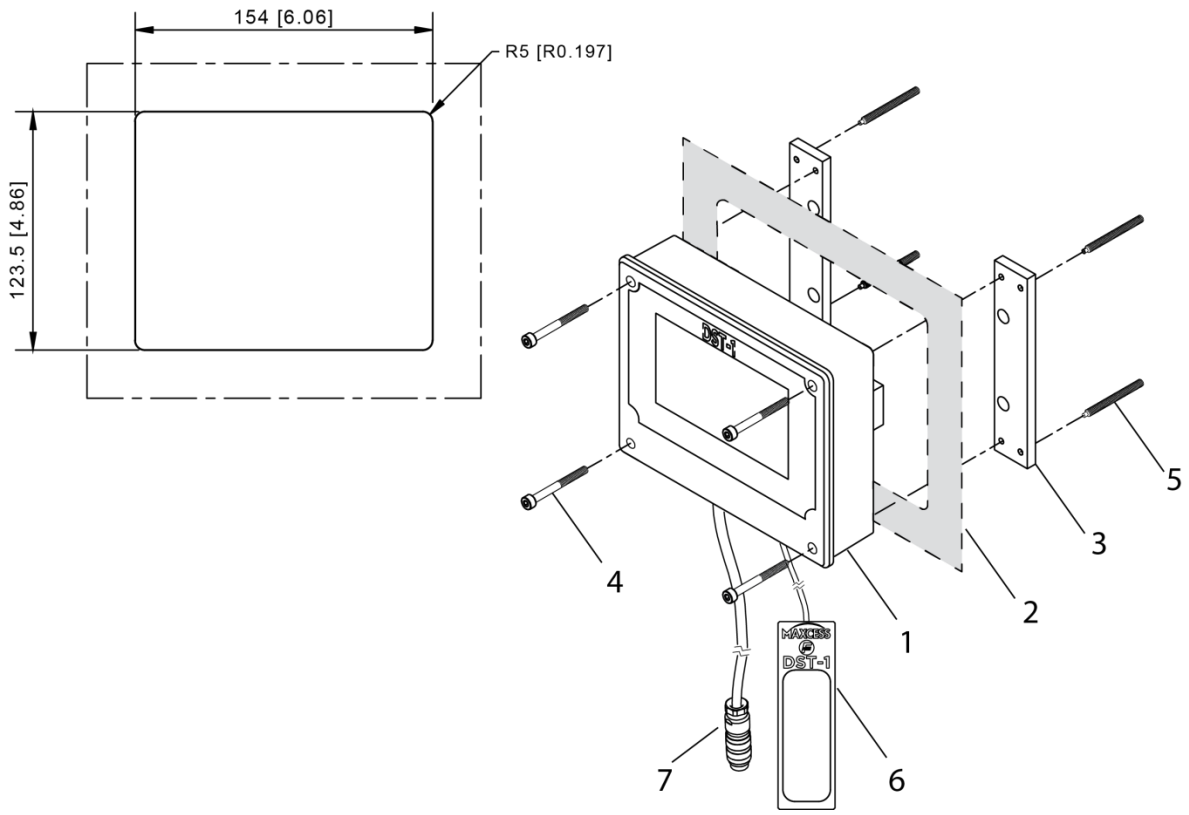
* These parts are available as a kit — Maxcess PN 290007415

** Feed these two items through the wall mount adapter to the cable clearance cutouts.

3.2.2 Panel mount

CAUTION – Never place electrical cables under mechanical strain. Always provide mechanical support of wiring with either clamps or flexible or rigid conduit.

Units are in millimeters [inches]



1 – Operator interface
2 – Panel cut-out (customer)
3 – Panel mounting bracket*
4 – Soc hd cap scr, M4 x 40, 4 each *
5 – Dog point set scr, M4 x 40, 4 each*
6 – DST-1 sensing element with cable**
7 – Output cable assembly**

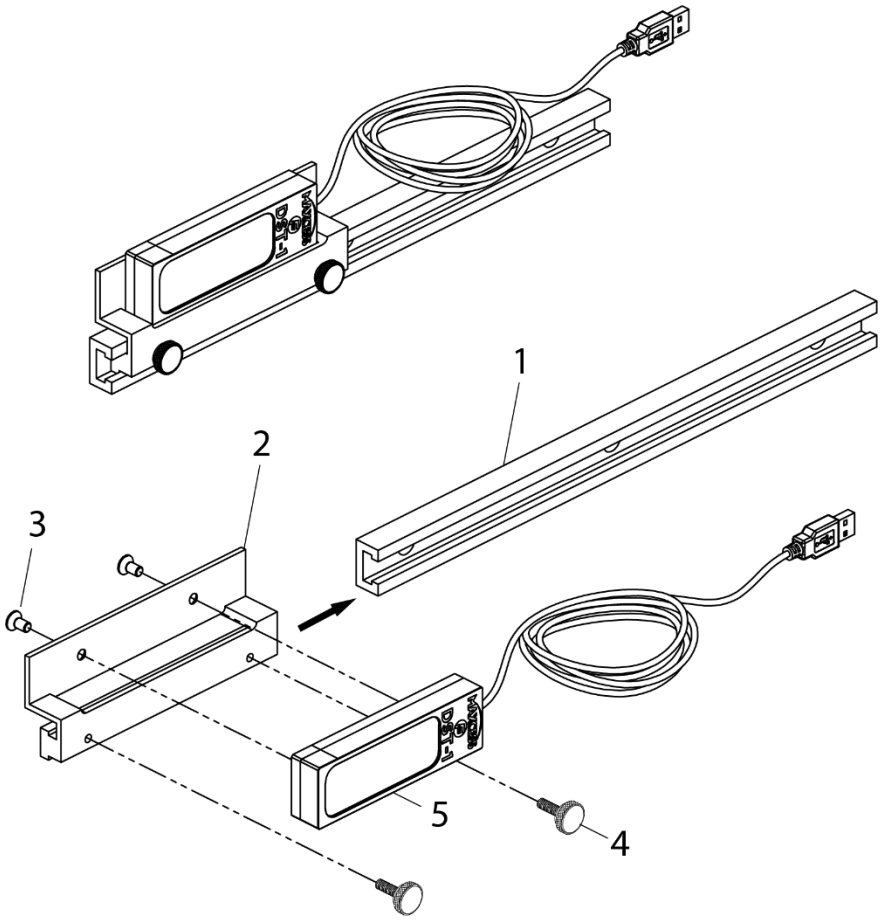
Figure 5. Operator interface panel mount installation

* These parts are available as a kit — Maxcess PN 290009991

** Feed these two items through the panel cutout

3.2.3 DST-1 mounting bracket assembly

CAUTION – Never place electrical cables under mechanical strain. Always provide mechanical support of wiring with either clamps or flexible or rigid conduit.



Description	Part number
1 – Extrusion	Custom length (see drawing 225774 for options)
2 – Mounting bracket	290007372
3 – Flat hd cap scr, M5 x 8, 2 each	29L91058001
4 – Thumb scr, M5 x 16, 2 each	29L92953004
5 – DST-1 sensing element with cable	290007384

Figure 6. DST-1 mounting bracket assembly

3.3 Electrical

Connect the power/signal connector from the DST-1 to any Maxcess guide or D-MAX unit.

When a guide is powered on, it will supply power for the DST-1 sensor.

3.4 Wiring diagrams

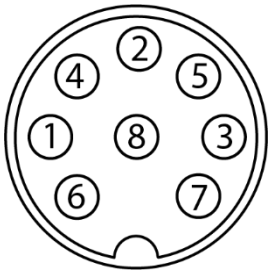
DST-1 Connector layout (viewed from the back side)	Operator interface pinout	
	Pin 1	Power input, positive
	Pin 2	Trigger input, positive
	Pin 3	Trigger input, negative
	Pin 4	RS485 input, positive
	Pin 5	Output 2
	Pin 6	Common return, ground
	Pin 7	RS485 input, negative
	Pin 8	Output 1

Figure 7. DST-1 to OI connections

3.5 Analog outputs

3.5.1 DST-1 Analog outputs 1 and 2

The outputs are designed to provide real-time control signal to a web guide system. They provide proportional response to detected web offset.

Both of the outputs are formed by open-drain transistor pins and the Common Return signal.

Each output requires an external load resistance value of 100 Ohms, connected between the output and return. (This applies only if a voltage output is needed in a stand-alone configuration.)

Outputs can be independently configured to deliver range of 0 to10, 0 to 20 or 4 to 20 mA over the input load.

Outputs can be independently configured for an inverted polarity. For example, 0 to10 can be switched to 10 to 0 output.

The default range setting for the Output 1 is 0 to 10 mA.

The default range setting for the Output 2 is 10 to 0 mA.

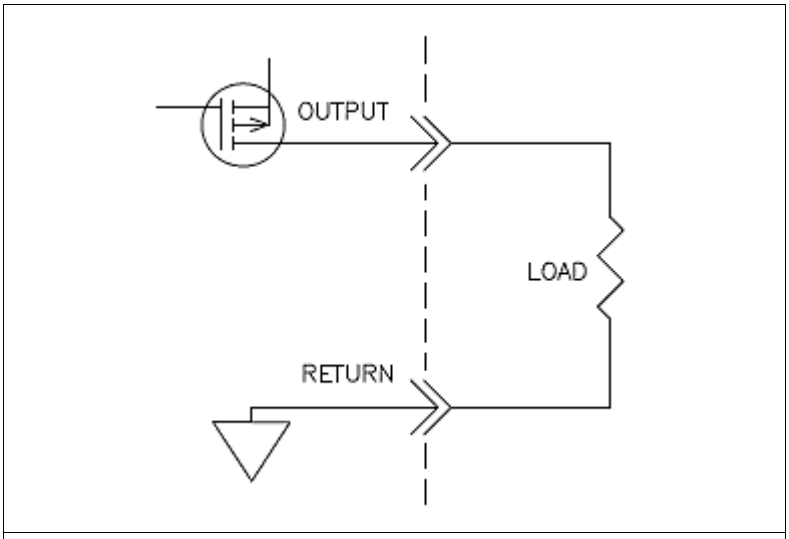


Figure 8. Typical output wiring schematic

3.6 Optical sensor installation

When planning to install DST-1 sensor, please be aware the sensor's large field of view and working distance. Any elements of machine frame in the view can potentially distract the sensor from the web guiding. Maximize the web view and minimize the presence of non-related elements to web guiding process. See Table 1.

Sensor operation can be affected by changing light conditions, such as ambient light changes caused by light sources with a rich IR component (for example, morning or evening sun visible in window, or incandescent and halogen lights in the sensor's direct view).

3.6.1 Optical sensor guidelines for installation

HOC	Horizontal optical center	23 mm
HFOV1	Typical horizontal field of view	~250 mm
HFOV2	Max horizontal field of view	~300 mm
VFOV1	Vertical field of view	~200 mm
VFOV2	Max vertical field of view	~220 mm
L1	Typical working distance	~200 mm
L2	Max working distance	~250 mm
HA	Horizontal viewing angle	~90°
VA	Vertical viewing angle	~70°

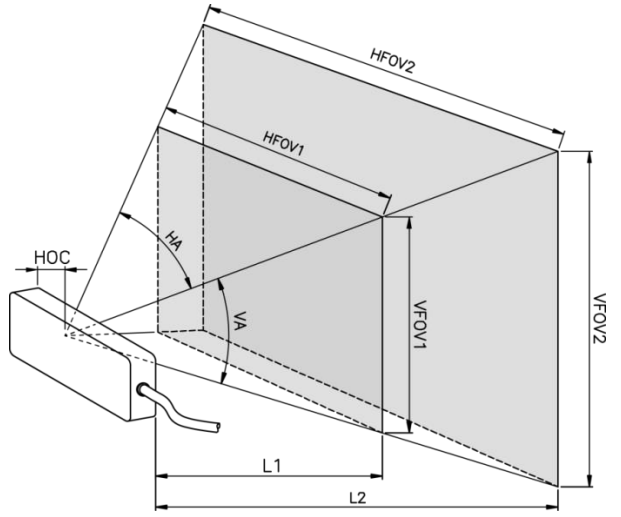
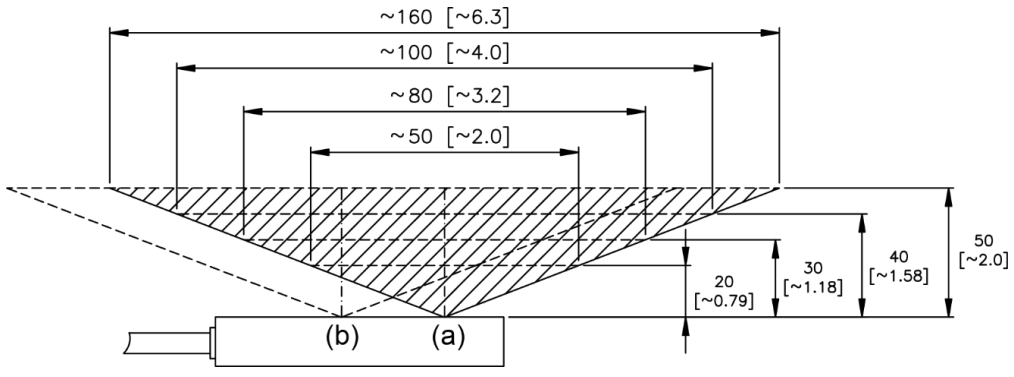


Table 1. DST-1 Sensor optical setup guidelines



(a) Main sensing element
(b) Secondary sensing element

Figure 9. Sensor element practical FOV at web distance range 20-50 mm [~0.75-2.0inches]

3.6.2 Sensor placement guidelines

Dimensions are in mm [inches]

(a) Main sensing element
The location of the optical center is defined by a line etched in the sensor body.

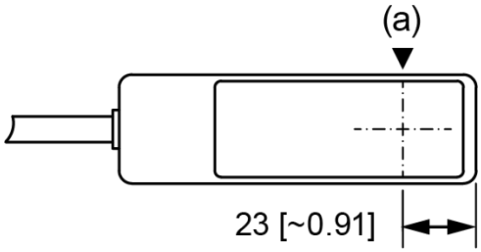


Figure 10. DST-1 sensor optical center location

(a) Sensing element
(b) Web

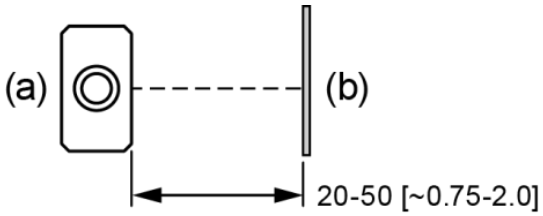
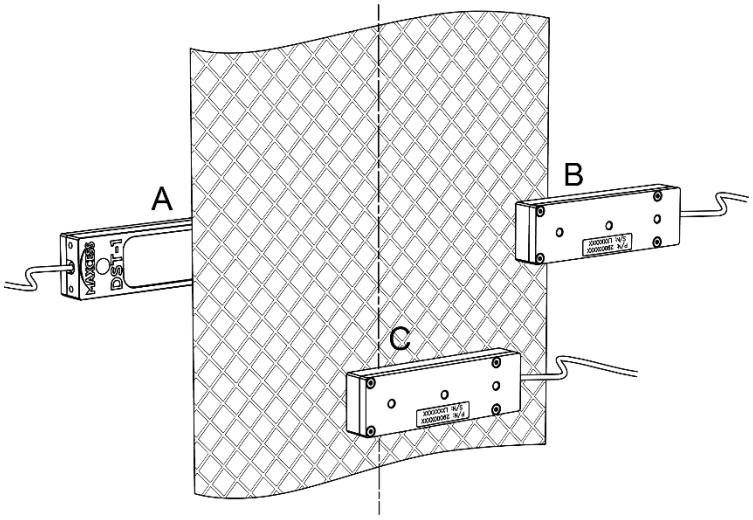


Figure 11. DST-1 recommended sensor to web distance



All sensing elements face the 'web' in this illustration.
A – Edge guiding
B – Edge guiding
C – Center guiding

Figure 12. DST-1 sensing element position examples

4.0 DST-1 Password Security

4.1 Overview

Password security settings allow administrators or privileged operators to protect selected functions from being changed or performed by personnel who do not have the authority.

Definitions for the purpose of this chapter:

Admin (or privileged operator) has a password and full access to all menus.

Operator does not have a password and can only access unlocked button functions.

Locked out = password protected

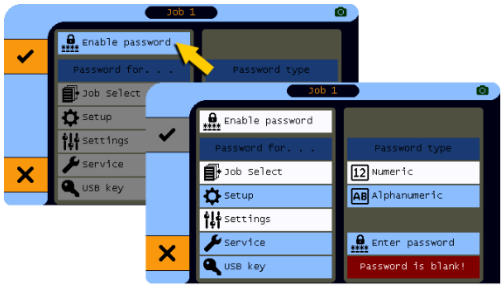
Login screen = password entry number pad/keyboard

Basic steps to activate security

- Enable a password
- Select the functions you wish to protect
- Set and save a password
- Log out of the Admin menu

All password security settings are reset to NONE after restoring configurations from a backup source.

4.2 Set up password security (first time use)



ENABLE PASSWORD

From the main screen, select ADVANCED SETUP > ADMIN > PASSWORD to access the password options screen.

Press ENABLE PASSWORD.

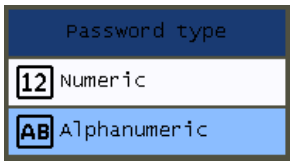
User-selected buttons and default selections will remain highlighted until future changes are made.

PASSWORD FOR...

Select the functions you wish to protect. In this example, SETUP, SERVICE and USB KEY are selected for password protection.

Menu item	Password locks out
JOB SELECT	Job selection
SETUP	All SETUP menu items
SETTINGS	GLOBAL SETUP / JOB SETUP
SERVICE	All SERVICE menu items
USB KEY	USB KEY, even if SERVICE menu is not locked out.

If no functions are selected when security is activated, only the ADMIN menu will be locked.



PASSWORD TYPE

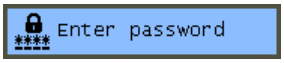
Select the type of password you want to use: NUMERIC or ALPHANUMERIC.

NUMERIC allows up to 9 characters, entered on a pop-up numeric keypad.

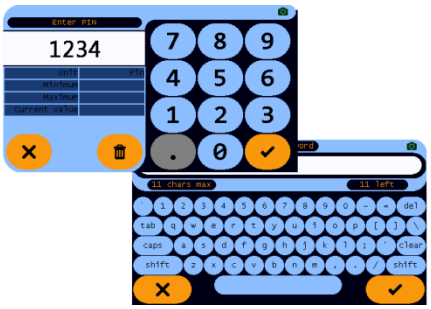
ALPHANUMERIC allows up to 11 characters, entered on a pop-up full keyboard. This option provides a higher level of security, even if an all-numeric password is chosen.

ALPHANUMERIC passwords can contain any character available on the DST-1 keyboard.

SET PASSWORD



1. Press to enter password; a number keypad or a keyboard will open, depending on the selected password type.



2. Enter a password.

Save password entry; return to the password options screen.

Cancel entry.

3. At the password options screen:

Save all password settings and return to ADMIN menu.

Lose settings and return to ADMIN menu.

LOGOUT to activate password security

At the ADMIN screen, the key indicates that password settings are enabled, and the admin is still logged in.

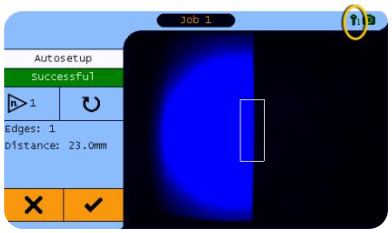
All menus are available; security is not activated.

You must LOGOUT to activate security.

You will be returned to the main screen after logging out.

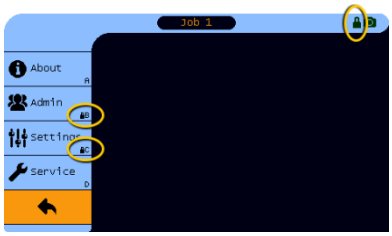
A lock icon will replace the key icon in the upper right hand corner, indicating that password protection is now in effect.

4.3 Identifying security status



Admin is logged in; no security

- Password protection is enabled but not activated.
- No password required; all menus are accessible to all users.
- Admin needs to log out to activate security.



Security is activated.

- Locked buttons require a password for access; operators cannot access any function with a lock icon on its button.
- Admin can press any locked menu to open a password entry screen.
- Failed password attempts take the user back to the previous screen.

4.4 Change password protection settings

Go to MAIN SCREEN > ADVANCED SETUP > ADMIN > PASSWORD

If the lock icon is present, enter password when prompted by the appearance of the login screen.

At the password options screen:

Highlighted selections indicate the current password settings.

(Change PASSWORD or PASSWORD TYPE; see page 23.)

1. Select the functions you wish to protect.

2. Save changes.

3. At the ADMIN menu, LOGOUT to activate the changes.

Lock icon will appear in the upper toolbar, indicating that security is activated.

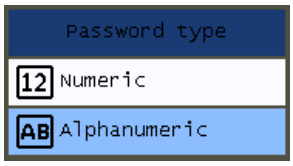
4.5 Change password or password type

From the main screen, select
ADVANCED SETUP > ADMIN > PASSWORD

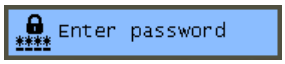
If the lock icon is present, enter password when prompted by the appearance of the login screen anywhere along the path.

At the password options screen:

Highlighted selections indicate the current password settings.



1. Select new password type.



2. Press to enter the password; a number keypad or a keyboard will open, depending on the selected password type.

If a password contains any alpha characters, you will need to delete it before you can switch to a NUMERIC password type — answer YES to the prompt if you wish to continue; the password will be cleared.

3. Enter a new password.

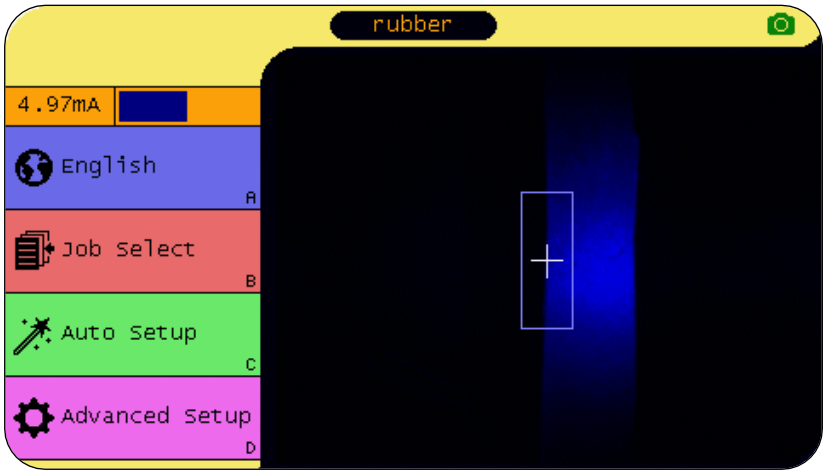
4. Save changes; return to password options screen.

5. At the ADMIN menu, LOGOUT to activate the changes.

Lock icon will appear, indicating that security is activated.

5.0 DST-1 Operator interface menu structure

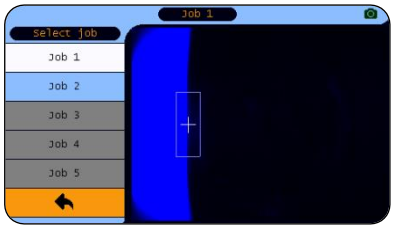
Main screen (top level menu)



LANGUAGE

MAIN SCREEN > 

Select the preferred user language.

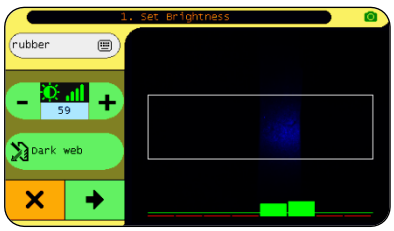


JOB SELECT

MAIN SCREEN > 

Contains list of previously defined and saved configurations (jobs). The user can recall any listed job.

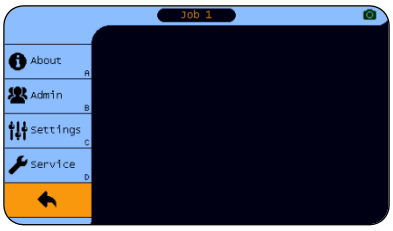
The JOB SELECT menu on the main screen is only available when you have more than one job enabled.



AUTO SETUP (simplified)

MAIN SCREEN > 

See Section 5.2 on page 26.



ADVANCED SETUP

MAIN SCREEN > 

Allows access to sensor settings and utilities.

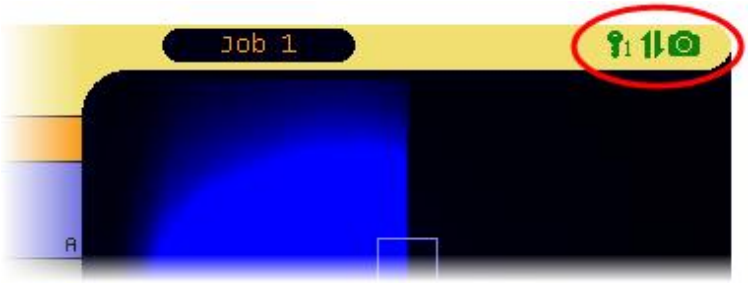
ABOUT contains product information

ADMIN login, logout, password setup, backup function, and restore utilities

SETTINGS provides access to sensor configuration.

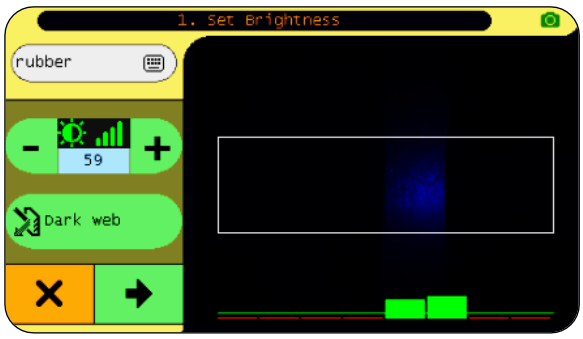
SERVICE contains maintenance utilities, such as firmware upgrade, testing, sensor pairing

5.1 Toolbar icons



Icon	Description
	The sensor is connected and functional.
	Digital Fife Sensor Serial Bus (FSBUS) communication has been established with the connected controller. See page 51; Digital Communication Interface
	Administrative protection is enabled, and no user is logged in. No access is granted to designated menus.
	Menu administrative protection is enabled, and the current user is logged in with permission to access all menus.
	A background image has been collected for subsequent subtraction from live video. This is used in special cases to reduce the effect of background interference.
	A USB memory device is connected and available. This is typically used for firmware updates. See page 11 for USB location.

5.2 Auto Setup (simplified)



MAIN SCREEN > 

The simplified Auto-Setup procedure is a series of three screens used to set brightness, detect web edge, and review results.

At the end of the procedure, you can save the results as the current job name, or you can edit the job name and save, which will replace the existing job.

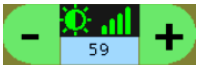
Active job

The name of the active job is displayed here. You can edit the job name; touch the button to open the alpha keypad.

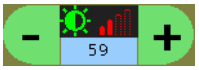
If you wish to activate a different job, go to MAIN SCREEN > JOB SELECT, or

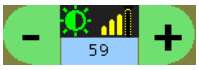
create and enable a new job; page 33.

1. Set brightness



Set web brightness. This step is important for web detection quality. Press (+) or (–) on the button to adjust the brightness.





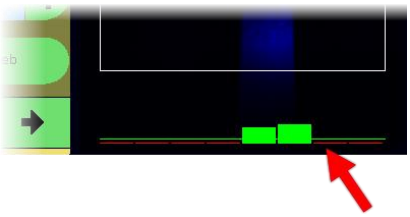
The indicator bars on the button provide real-time feedback as you fine-tune the brightness..

Dark web assist mode

Use this mode for materials with very poor IR reflection properties.

Press to toggle the function on or off.

When this mode is ON, the button is purple.



The bar graph below the web field of view (FOV) shows the brightness for each FOV segment.

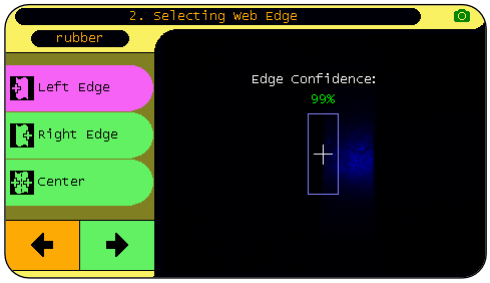
The solid horizontal line indicates the average level of brightness for the entire FOV.

When there is too much backlight, or not enough, the line will turn red.

Continue to next screen, OR

Return to previous screen

2. Select web edge



Press to select Left or Right edge, or Center; your selection will be highlighted in purple.

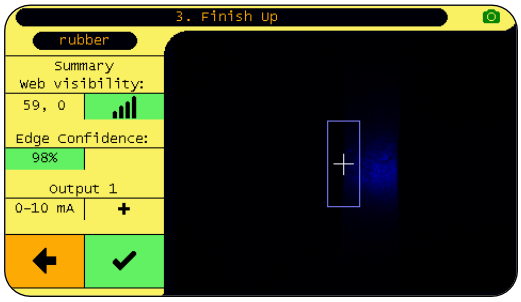
This example shows that the Left Edge is selected.

Edge detection quality, or Edge Confidence, is shown as a percentage.

Continue to next screen, OR

Return to previous screen

3. Review results

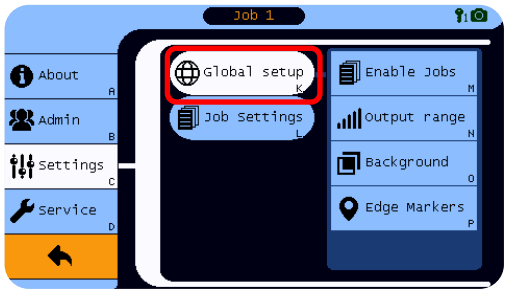


View results of the setup. In this example:
Active job = rubber
  Web visibility summary
    Brightness level = 59
    Dark web mode is off = [0]
  Edge confidence = 98%
  Sensor output 1 = current range 0 to 10 mA, positive polarity

Accept setup results; changes, including changes to the job name, will be saved to the existing job number.

Return to previous screen; changes are not saved.

5.3 Global setup

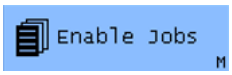


From the main screen, select
ADVANCED SETUP > SETTINGS > GLOBAL SETUP

These parameters cover some physical elements of the sensor output settings, and other user display preferences and job presets.

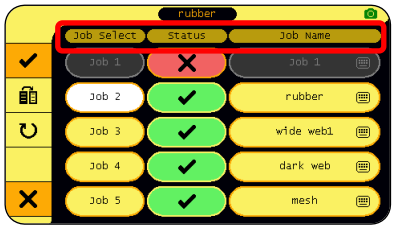
Any change made in the global parameter group affects all other sensor elements and their performance.

5.3.1 Enable jobs



Use to save current sensor configuration as a named preset file (job) that can be recalled for later use.

Up to five jobs can be saved internally on the sensor.



The job number highlighted in white is the currently selected (active) job.

Set job status

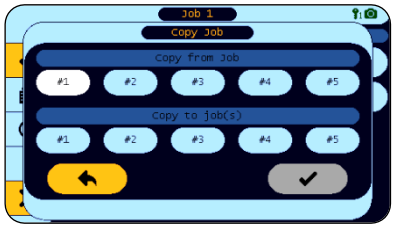
Touch the Status button to toggle the job state.

Job is enabled

Job is disabled

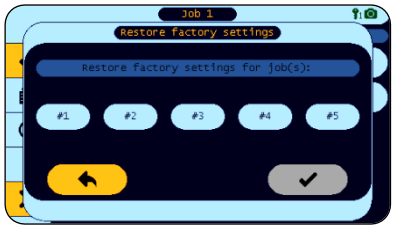
Name a job

If a job is enabled, you can rename or copy the job. Touch the Job Name button for any enabled job to open an alpha keypad; type in a job name. Save or cancel to return to the job screen.



Copy job

Touch the Job# you want to "Copy from...", and then touch the Job# you want to "Copy to..."



Restore a job to factory settings

Touch the Job# that you want to restore to factory default settings. Only the job numbers that you select will be reset.

5.3.2 Output range

Output 1 range
Sensor main analog output current selector, range options: 0 to 10 mA, 0 to 20 mA, 4 to 20 mA

Output 1 polarity
Main output polarity toggle selection. Switches between incremental and decremental output behavior.

Output 2 range
Sensor second analog output current selector, range options: 0 to 10 mA, 0 to 20 mA, 4 to 20 mA

Output 2 polarity
Second output polarity toggle selection. Switches between incremental and decremental output behavior.

5.3.3 Background

Do not use unless recommended by Maxcess Technical Support.

5.3.4 Edge markers

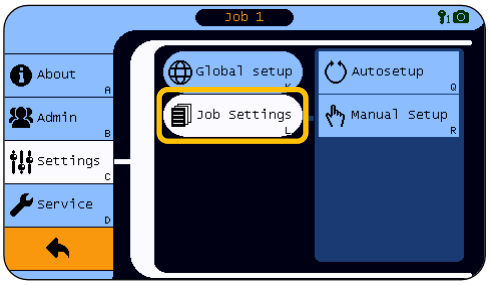
Edge markers are visual aids that you can toggle on or off.

Main edge
Enable or disable main edge detection point; visible when edge is detected.

ROI (Region of Interest)
Enable or disable ROI presence; see page 47.

Minor edge
Enable or disable minor edge detection point; visible only when enabled.

5.4 Job settings



From the main screen, select
ADVANCED SETUP > SETTINGS > JOB SETTINGS

Job Settings are unique to each saved job.

5.4.1 Automatic setup

Many opaque web materials use guiding settings that are simple enough for the sensor automatic setup procedure. See page 31.

5.4.2 Manual setup

Manual setup is used for web materials with special properties or for setting a guide target at the specific place in a web.

Custom settings include camera parameters, signal function types, and signal web processing parameters. See page 33.

6.0 Automatic setup procedure

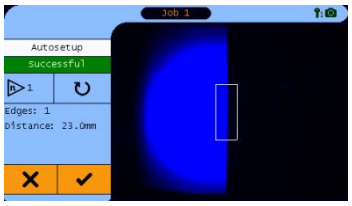
The procedure is based on the following rules:

1) Auto-setup will overwrite the current job settings. If you wish to save the current job, enable and select a new job before running auto-setup.
2) Auto-setup procedure is expecting an opaque web material.
3) The sensor output range is already pre-set by the user, see Global Setup > Output Range menu (page 29).
4) The web is loaded in front of the sensor (see Figure 12 for sensing element positioning). Auto-setup can distinguish between right edge, left edge and center guiding.
5) Distance to the web is within recommended range; see Figure 11. If center guiding mode is desired, both edges of the web must be clearly visible on the OI screen.

From the main screen, select
ADVANCED SETUP > SETTINGS > JOB SETUP > AUTO-SETUP

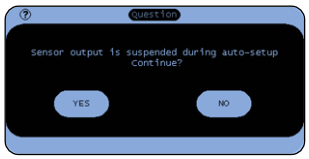
Press to toggle between Outputs 1 or 2.

Press to start AUTO-SETUP.



The auto-setup process takes approximately ten seconds.
If successful, ROI edge marker(s) appear on the web image; the AUTOSETUP header updates its status to COMPLETED.

Message window: **Sensor output is suspended during auto-setup. Continue?**



Yes = When auto-setup runs, the last known output signal is frozen until the process is complete. When you save the results of the auto-setup, the signal updates and resumes output.

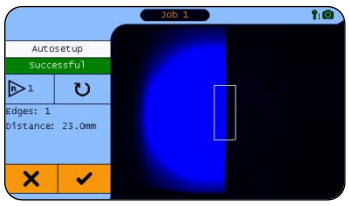
No = Returns to the SETTINGS screen.

---

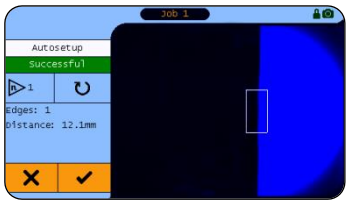
continued

Auto-setup continued

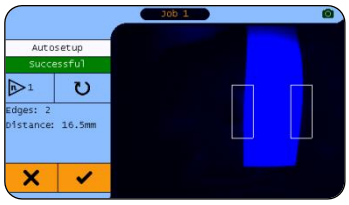
There are four possible outcomes for auto-setup.



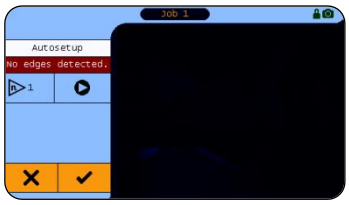
Right edge guiding



Left edge guiding



Center guiding



Web detection failed

Press RESTART to run auto-setup again, if you wish.

Save results.

Cancel and return to previous screen.

7.0 Manual setup parameters

7.1 Introduction to sensor operating parameters

To aid in understanding the device configuration procedure, this section presents the device structure, key parameters, their practical functions and graphical representation on the OI screen.

DST-1 signal internal processing consists of three major system elements, illustrated in Figure 13.

1) Acquiring a web image — Camera #
2) Processing it — Signal #
3) Generating output signal for a web guide system — Output #

The character "#" is a placeholder for a number that represents each particular system element, since there is more than one of each. The table below outlines the quantity of each and their possible combinations.

Figure 13. DST-1 Sensor internal signal processing flow order

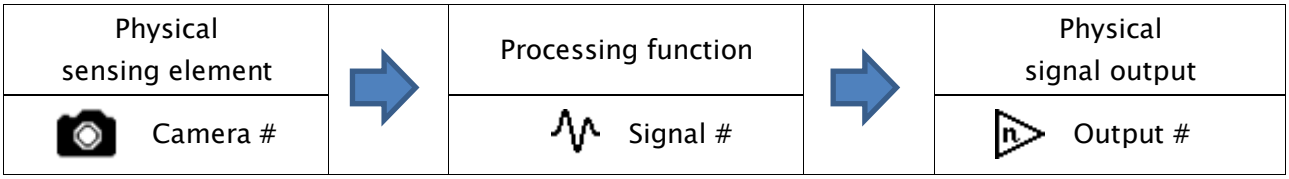
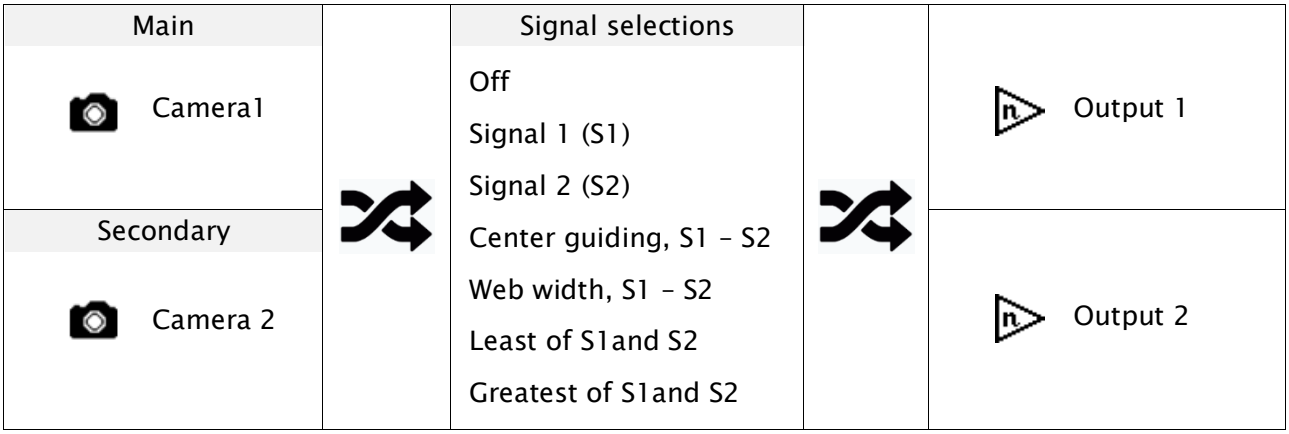


Figure 14. DST-1 Sensor system elements



The signal processing element can produce a number of signals and their combinations, extracted from a web image, and ready to be wired to an output. There are number of parameters to be set in order to connect the desired signal to a proper output. These parameters are divided into two groups, "global" (not related to any job settings) and "job related" settings.

Manual setup parameters continued

The manual setup procedure works in the opposite direction of the sensor data flow as described in Section 7.1; page 33.

Start with the Output selection and step through the signal functions and individual signal definitions.

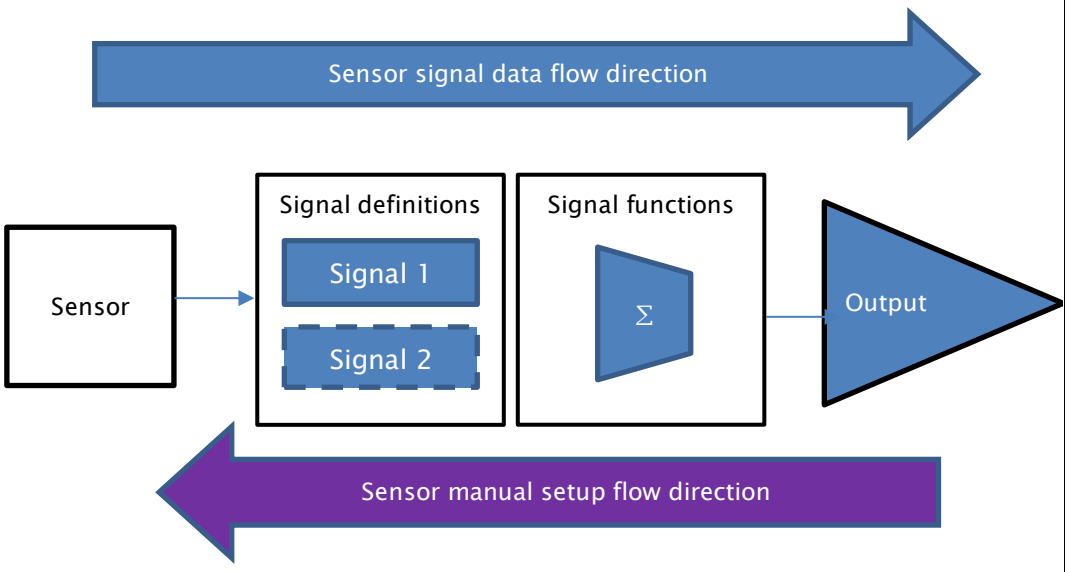


Figure 15. Signal data and manual setup flow directions

Each new job configuration consists of two separate sets of parameters:

Camera backlight settings — can be edited and saved separate from Parameter Group 2, Table 2.

Output and Signal settings — can be edited and saved separate from Parameter Group 1, Table 2.

Both sets of parameters are part of the same numbered job. When starting a new job configuration, the factory defaults are loaded; they are listed in Table 2 on page 35.

7.1.1 Factory defaults

Parameter group 1		CAMERA	
	Parameter name	Default value	Notes
1	CLR/REFL WEB	Off	Default setting for opaque web
2	Gain	16	Minimum
3	Depth	200	Value for a web distance 20 to 50 mm
4	Brightness	4	Minimum
Parameter group 2		OUTPUT N	
1	Signal Function	Output 1 – Signal 1 Output 2 – Off	By default, Output 1 is configured to use Signal 1
2	Edge/Line detection function	Signal 1 – F1	Opaque web, right edge
3	ROI	Single Vertical Dynamic	Single ROI enabled Vertical shape orientation Not limited horizontal ROI tracking

Table 2. Factory default job configuration settings

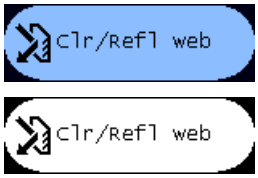
7.2 Camera parameters

The camera parameters group includes four parameters that control backlighting of the sensing element.

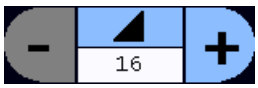
These parameters are used to highlight and enhance web features for the underlying image processing functions.

From the main screen, select
ADVANCED SETUP > **SETTINGS** > **JOB SETTINGS** > **MANUAL SETUP** > **CAMERA**

Press to access camera parameters, which are presented on the screen in the following order:



Clear/Reflective
Toggle button to adjust sensor backlight between web types:
OFF: Opaque, matte, non-gloss, non-glare
ON: Clear, reflective, glossy



Gain
Default: 16
Range: 16 to 63
Do not use unless recommended by Maxcess Technical Support.

Depth
Main backlight control parameter
Default: 200 (for web distance 20 to 50 mm)
Range: 0 to 1000* (*effective maximum)

Brightness
Do not use unless necessary to extend backlight **Depth** range
Default: 4
Range: 4 to 15

Press to save settings.

Press to cancel and return to previous screen.

7.3 Signal function types

As the camera sensing element feeds a web image to the signal block, it can be interpreted in a number of ways. To simplify the web image translation, the signal parameter defines this process.

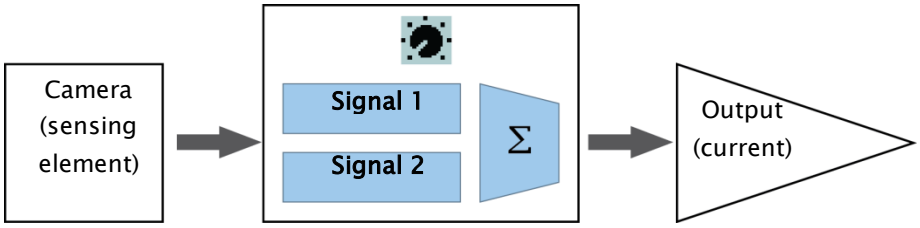
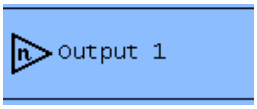
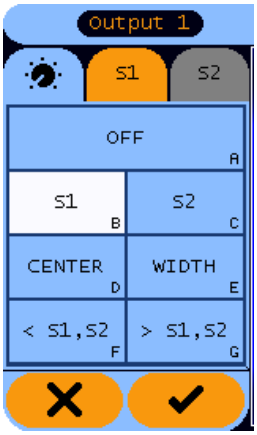


Figure 16. Signal parameter logic



From the main screen, select
ADVANCED SETUP > SETTINGS > JOB SETUP > MANUAL SETUP > OUTPUT 'N'

Press to access signal function types for Output 1 or 2.



Signal function type
This parameter describes signal behavior.
The corresponding tab for S1 or S2 is orange until selected for configuration; see page 38.

The following signal types are available.

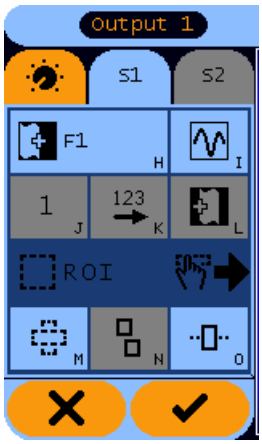
Signal code	Description
OFF	No signal is wired to an Output N Dead Output selection
S1	Individual Signal 1 is wired to an Output N. An Output reports Edge/Line position
S2	Individual Signal 2 is wired to an Output N. An Output reports Edge/Line position
CENTER	Center-guiding signal (calculated from S1 and S2) is wired to an Output N An Output reports center-guiding solution
WIDTH	Web width signal (calculated from S1 and S2) is wired to an Output N An Output reports Web Width solution
< S1, S2	Least signal (of S1 and S2) is wired to an Output N Least signal is reported on an Output
> S1, S2	Greatest signal (of S1 and S2) is wired to an Output N Largest signal is reported on an Output

used for irregular web profiles

Table 3. Signal function types

7.4 Signal web processing parameters

These parameters configure web image processing algorithms. They are unique for each signal.



From the main screen, select

ADVANCED SETUP > SETTINGS > JOB SETUP > MANUAL SETUP > OUTPUT 'N' > tab S1 or S2.

When a signal is enabled, its tab is blue. This example shows S1 enabled and S2 in OFF state.

Because each output can have up to two signal functions associated with it, each signal must have its own web processing function.

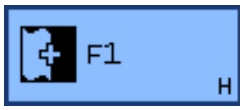
Minimum configuration consists of one sensor, one signal and one output.

Maximum configuration is allowed to have four signals (two for each output). These parameters are divided into the following functions:

Button code	Icon	Function	Page
H	F1 – F7	Edge/line detection functions	39
I		Signal strength view	43
J	1, 2, 3, …	Edge/line selection function	44
K		Edge/line counting direction function	44
L		Edge/line active signal polarity function	46
M		ROI orientation function	47 Table 6
N		ROI synchronous/independent function	
O		ROI dynamic/static position function	

Table 4. Button codes for output signal parameters

7.4.1 Edge detection functions – H button



Each function has an associated image and code name, for example, **Fn**.

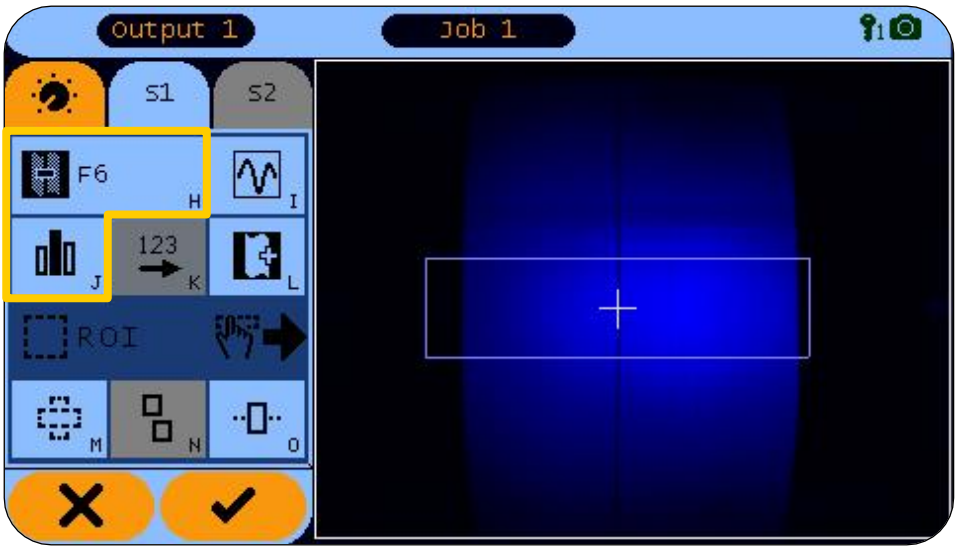
Press the icon to cycle through the options described below.

Visual examples are provided on pages 40–42.

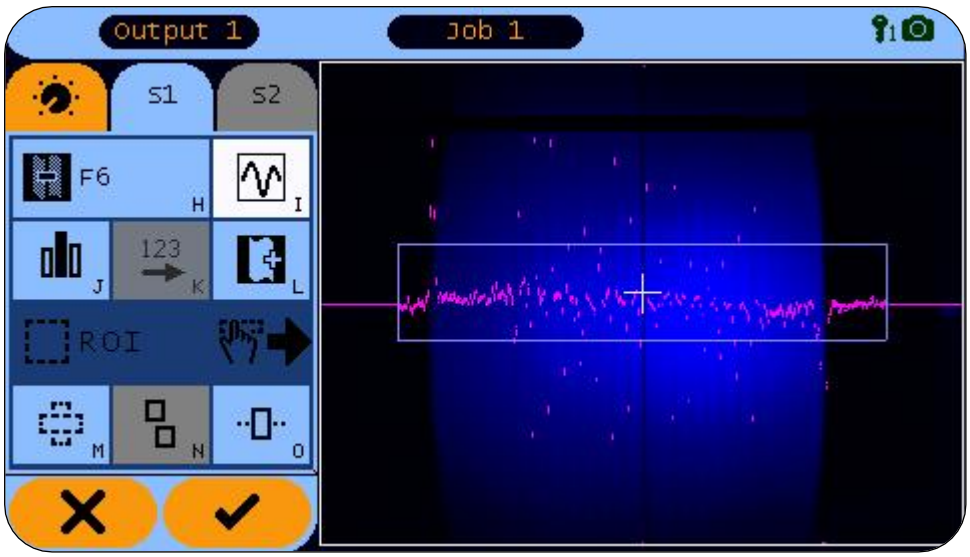
Code	Icon	Description	Web type
Standard edge detection functions F1 through F4			
F1		F1 function is always looking for the right edge in associated ROI.	Opaque Non-gloss
F2		F2 function is always looking for the left edge in associated ROI F2	Opaque Non-gloss
F3		F3 function is always looking for the right edge in associated ROI, or the light transition from bright to dark	Clear Reflective Glossy
F4		F4 function is always looking for the left edge in associated ROI, or the light transition from dark to bright properties.	Clear Reflective Glossy Bright
Advanced edge/line detection functions F5 through F7.			
F5		F5 is an advanced version of F1 and F2 modes. Adds an edge/line count and transition mode selection.	Opaque
F6		F6 is an alternative variant of F7 mode, capable of detecting edge/line in spite of signal noise.	Clear Reflective Non-woven Edge and line guiding
F7		F7 is an advanced version of F3 and F4 modes. Adds an edge/line count and transition mode selection.	Clear Reflective Non-woven Edge and line guiding

Table 5. Edge/line detection functions

Example of F6 mode with J button set for "best" signal



Guide point is set up on the dark line in the middle of the web. This web example exhibits a large number of vertical lines (mesh-like web).



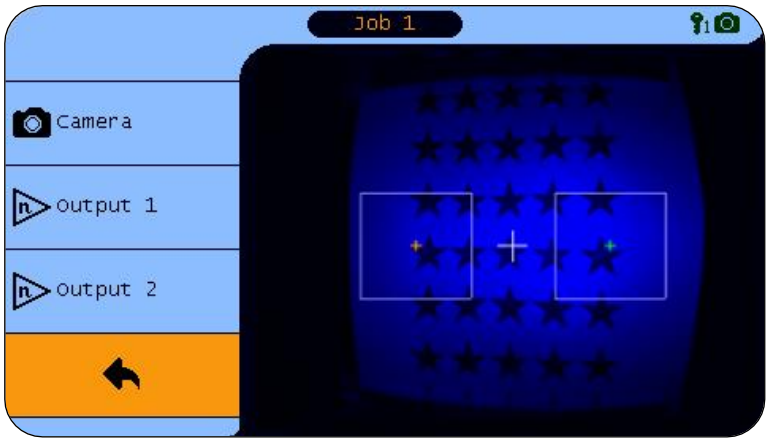
This is the same setup with signal strength shown; notice the large number of misleading signals coming back from this mesh vertical line construction. In F6 mode, with the J button set for "best" signal, the dark line is detected in spite of the signal noise.

See Signal Strength View, page 43.

Example of F7 mode

These examples illustrate center-guiding with very complex non-woven web material. The web material is white in color with repeatable hole pattern.

For this application, the ROIs should be wide enough to “see” all or at least some of the adjacent column of stars. The vertical size of the ROI is also important to ensure reliable sensing of the star columns.

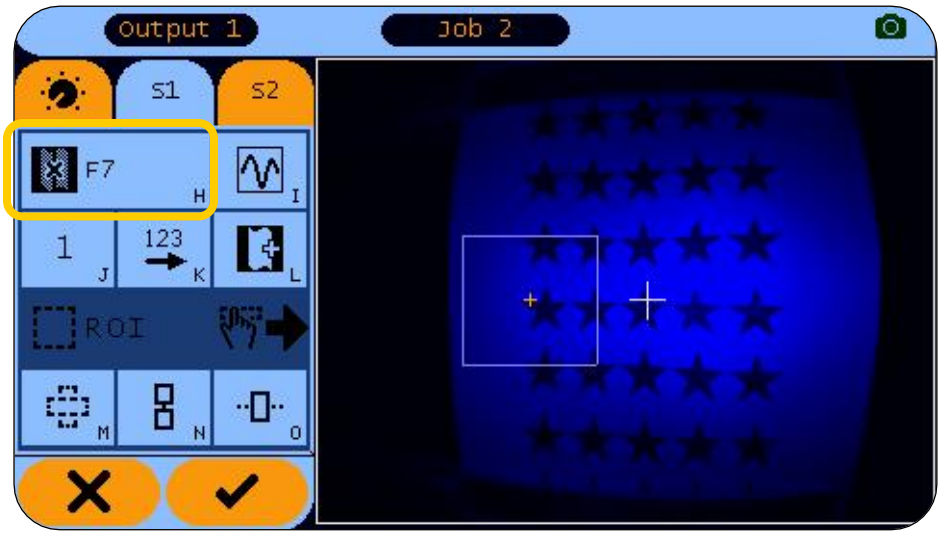


The sensor mode is S1 and S2 combined, selected as Center guiding.

Note the uneven edges of the web material. In many cases, the center-guiding mode is used to cut off unnecessary material on both sides of the web.

F7 example continued on next page

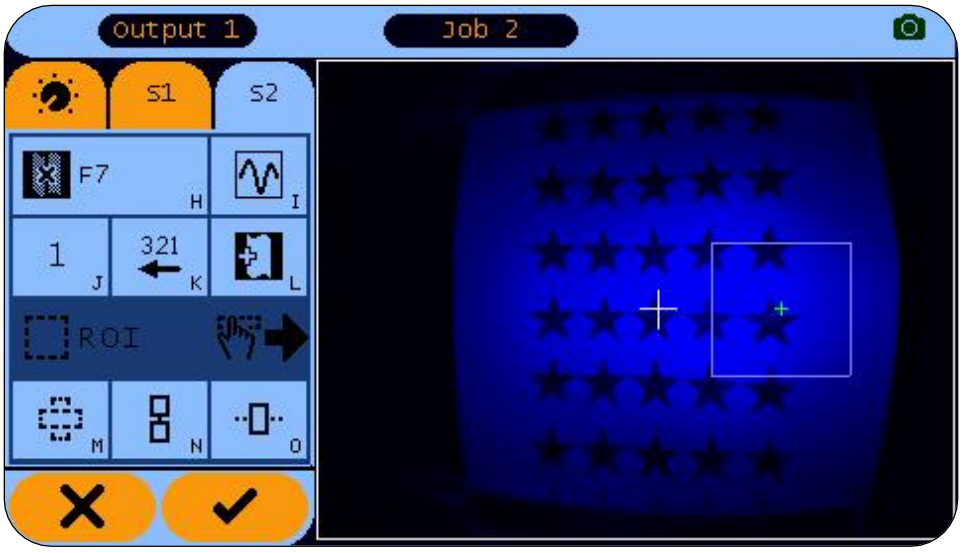
Example of F7 mode – continued



Signal 1 setup for mode F7

The small cross represents the signal (S1) generated by the combination of **F7** mode and buttons J, K, and L.

The large white cross represents the guide center point output, generated by a combination of S1 and S2.

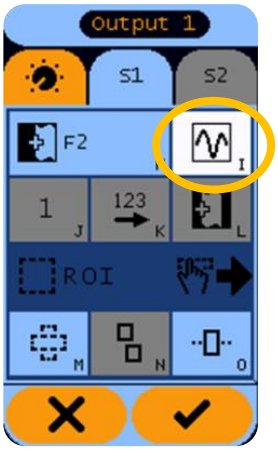


Signal 2 setup for mode F7

The small cross represents the signal (S2) generated by the combination of **F7** mode and buttons J, K, and L.

The large white cross represents the guide center point output, generated by a combination of S1 and S2.

7.4.2 Signal strength view – I button



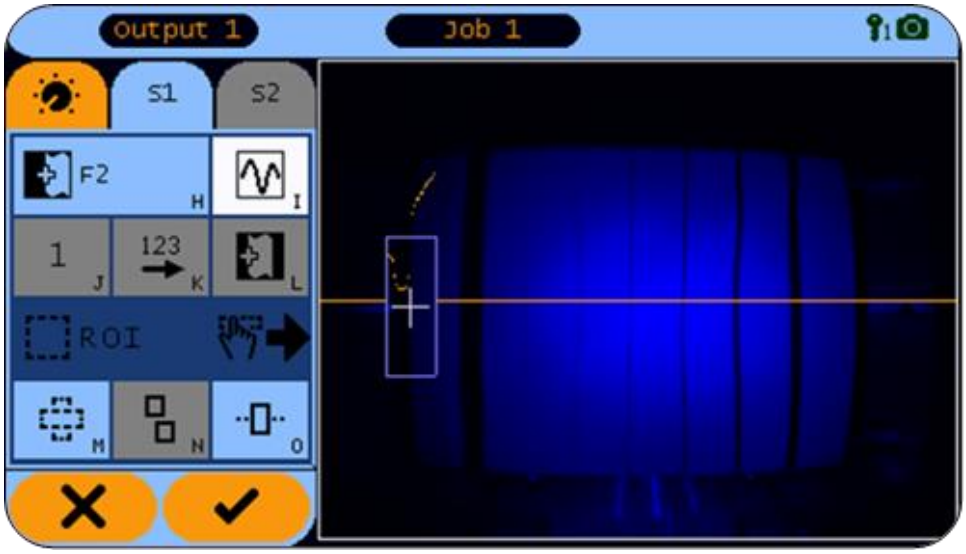
Press to toggle the **I** button ON to enable view of the web signal amplitude.

OFF

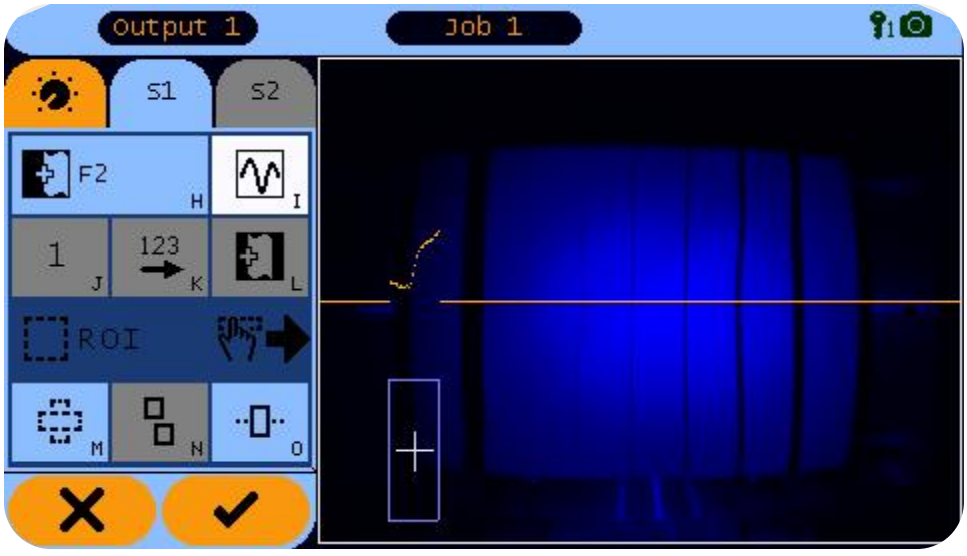
ON

In the examples below, notice how ROI location affects the edge signal peak amplitude and dark-to-light ratio.

Note: ROI (Region of Interest), see page 47.



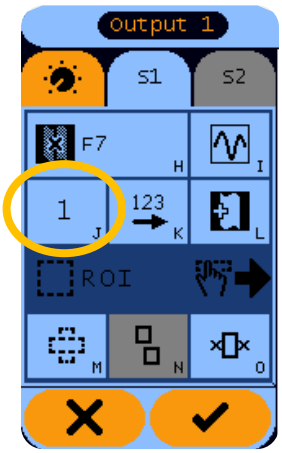
Example of good signal strength



Example of poor signal strength

7.4.3 Edge/line number selection – J button

Enabled and active only for Modes F5, F6, and F7



Press the **J** button to cycle through the following options.

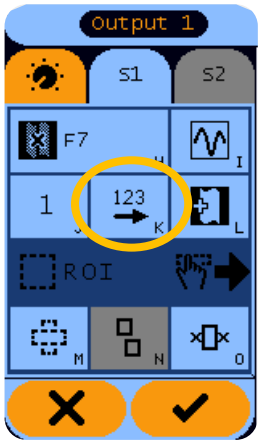
Edge/line selection
The first edge/line is active.

Edge/line selection
The "n" edge/line is active.
Note: Letter "n" here represents a number from 2 to 16; press the J button until you reach the desired number.

Best Edge/line selection
The best edge/line is active.
The judgment is based on the edge/line signal strength.
This signal setting also observes the selected edge polarity specified by the L button (selected edge polarity).

7.4.4 Edge/line count direction – K button

Enabled and active only for Modes F5, F6, and F7



Press the **K** button to toggle edge/line count direction.

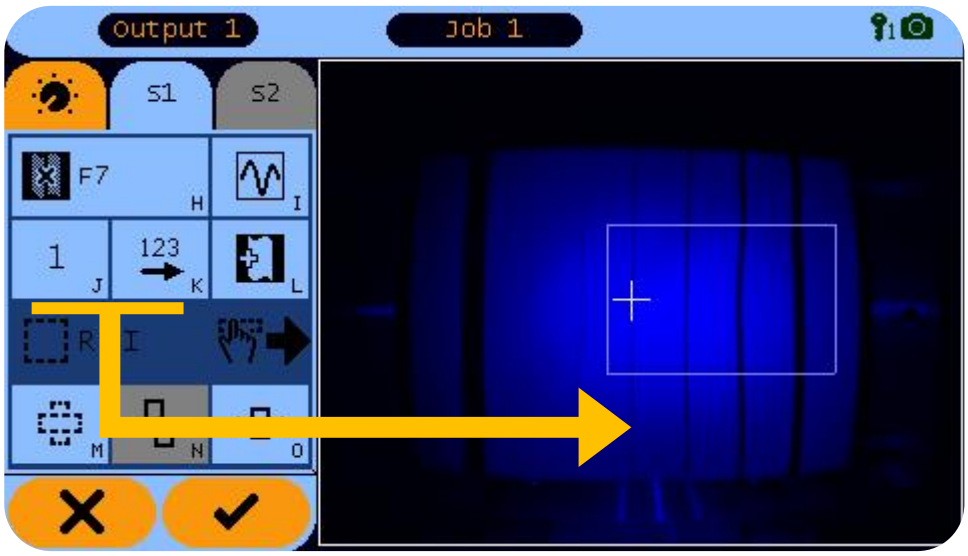
K–1 Left to right edge/line count direction

K–2 Right to left edge/line count direction

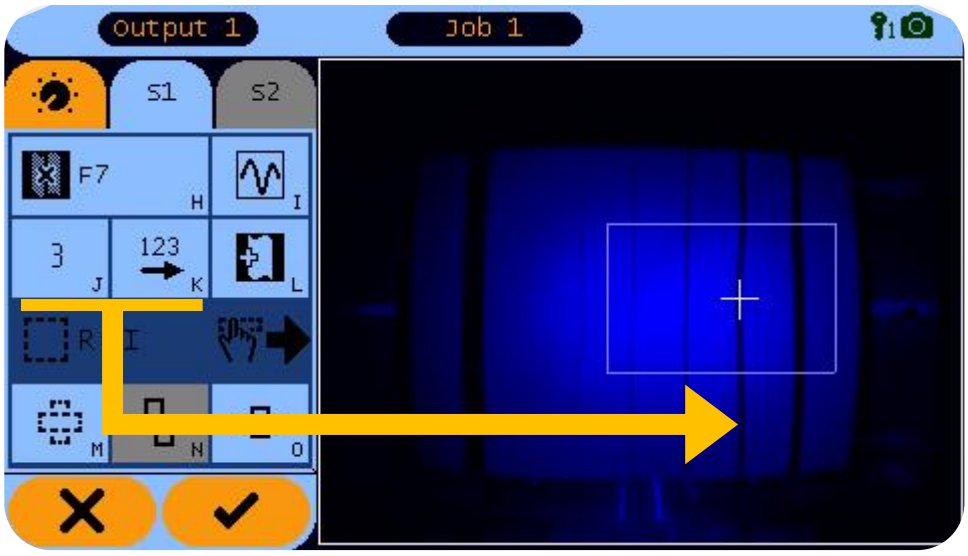
See examples for buttons J and K on next page.

Examples using buttons J and K

In these screen examples the Static ROI mode is used. This allows the sensor to focus on the specific area of the web by avoiding all other web details outside of the region of interest.



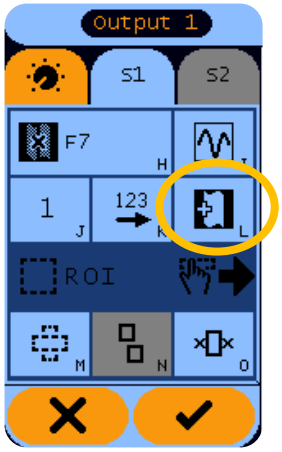
The first edge/line is active.



The third edge/line is active.

7.4.5 Edge/Line active signal transition polarity – L button

Enabled and active only for Modes F5, F6, and F7; for guiding to a virtual edge or line created by a change in contrast.



Press the **L** button to cycle through the following options to select edge/line active signal transition polarity.

 Dark to bright transition is selected.

 Bright to dark transition is selected.

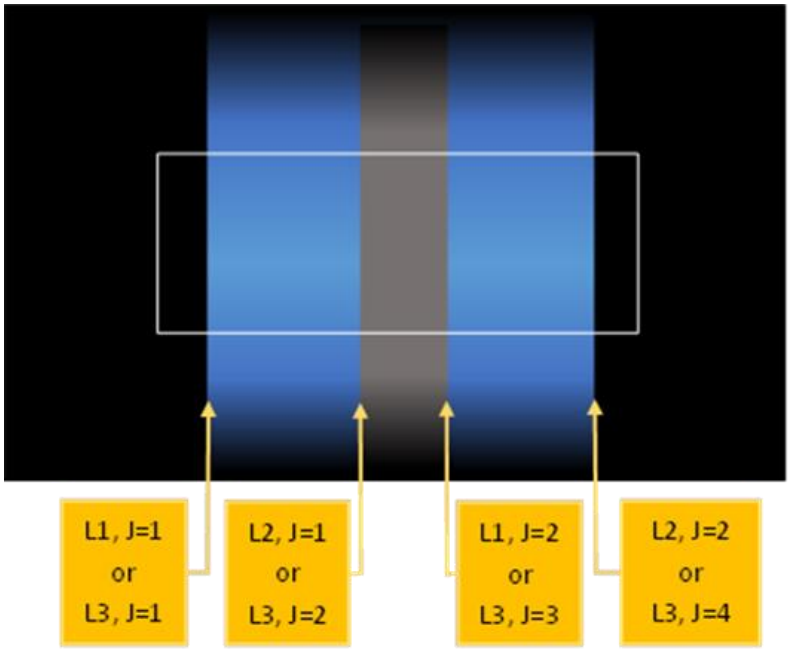
 Either transition selection is active.

For a practical example, consider a brightly lit web with a thick dark stripe in the middle, as shown below.

Other sensor settings are:

- **Edge processing mode**
  H = F5 – F7 (web material dependent)
- **Edge/line count**
  J = 1, 2, … (max count depends on **L** button selection)
- **Scan direction**
  K = left to right (123)
- **ROI** = Dynamic or Static

The resulting edge pick output is based on specific **L** and **J** buttons settings, as shown here.



7.4.6 ROI definition and configuration

Region of Interest, or ROI, is a very important set of parameters for the web processing algorithms.

ROI is an element of the communication link between the technician setting up the job and the sensor image processing methods. ROI allows the sensor to focus on specific elements of a web, and to track its edge or line movements.

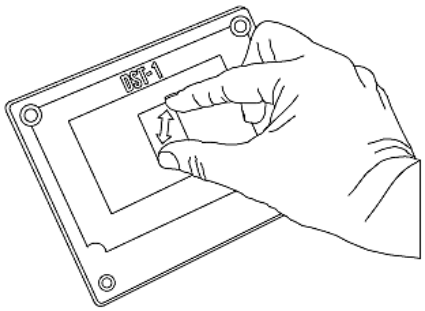
The ROI parameter set includes the number of defined regions, a description of their positions and behavior on the screen. Key ROI parameters and their icon representations are listed in the table below.

You can use the DST-1 OI touch screen to set ROI; see page 48.

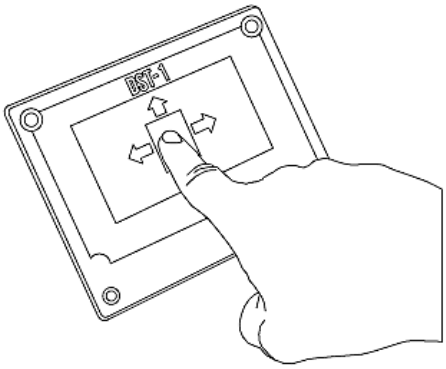
ROI function	Icon	Description
Flip ROI button		User aid to define ROI orientation. Flips ROI from horizontal to vertical and vice versa.
		Free-hand ROI User can reshape ROI and move it around the screen. User can stretch ROI to some limits, which are the defined by the sensor image processing function.
Dynamic ROI		Toggle function between Dynamic and Static ROI. Dynamic ROI mode allows it to follow its target across whole horizontal Field of View (FOV)
Static ROI		Toggle function between Dynamic and Static ROI. Static ROI mode does not allow it to move horizontally across the sensor's FOV. This mode is useful when, for example, there is a machine frame presence in the FOV, which can distract the sensor from normal operation.
Synchronous ROI		This is a user aid that synchronizes changes made on one ROI to the secondary ROI and vice versa. Its primary use is to make both ROIs the same size.
Asynchronous ROI		Defines two independent ROIs, which can be dragged and set at key web image locations. In this mode, each ROI is processed independently and the result can be separate or combined output from the sensor. Useful for center-guiding, web width measuring, etc.

Table 6. ROI function icons

7.4.7 Using DST-1 OI touch screen to set ROI



Example 1.
Defining ROI size.
Use two fingers to re-size and watch for the maximum size limits.

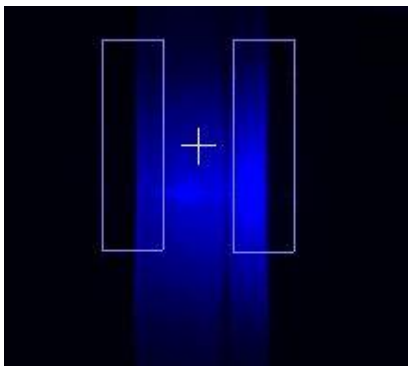


Example 2.
Defining ROI position.

Drag the ROI with your finger over web edge/line.

If the Dynamic ROI setting is enabled, the horizontal position will be controlled by the configured edge location, and dragging the ROI only sets the vertical position.

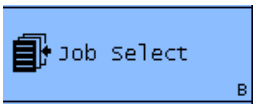
Both horizontal and vertical position may be set when configured for Static ROI operation.



Example 3.
Two dynamic asynchronous ROIs defined as Signal 1 and Signal 2 for center-guiding on transparent web material.

The web center signal is computed and fed to the selected Output number.

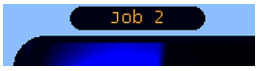
7.5 Manual setup procedure steps



1. Job select

First time use: Job 1 is configured with factory defaults (page 35).

When only Job 1 is enabled, the Job Select option is unavailable. You can either reconfigure Job 1, or go to main screen and select **ADVANCED SETUP** > **SETTINGS** > **GLOBAL SETUP** to enable another job and start the configuration process.



The current job name is displayed at the top of the screen.

2. Camera backlight

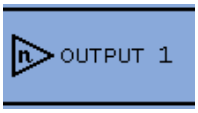
Access the backlight (depth) settings. All of the web detection functions rely on a well-lit web image. The backlight parameters are described in CAMERA parameters on page 36.

The camera settings are saved separate from the Output and Signal settings, but they are stored in the same job number, and could be recalled all together for later use.

Press to save the camera settings, or

Press to cancel settings.

Either selection will return you to the previous screen.



3. Output N selection

Enter the sensor configuration settings for the current job. You can exit any time, by pressing the save or cancel buttons on the bottom of the screen.

a) Signal functions

The signal function tab lists all possible signal combinations before it is fed to the Output N.

The combinations are: OFF, Signal 1 or Signal 2, and their combinations – Center guiding, Web Width, Least or Greatest of them

b) Signal processing

Select S1 or S2 to enter that signal's web image processing configuration screen.

Select target web edge, based on web type, and ROI size and position.

continued

c) Edge/line function

Edge/line detection is based on different web material properties.

Press this button to cycle through the detection options. The options are described on page 39.

d) ROI (Region of interest)

There are set of toggle buttons and touch-screen dragging and resizing options, related to ROI shape, size and behavior. For details, see page 47.

4. Save the settings

Press to save any new job configuration settings made in Steps 3 through 7 and return to the previous screen.

If you cancel at this point to return to the previous screen, you will lose all selections except camera settings.

8.0 Fife Sensor Serial Bus (FSBUS)

DST-1 edge information is always presented using two analog outputs that are independently configurable for OFF, 0 to 10 mA, 0 to 20 mA, or 4 to 20 mA scales. When connected to a Fife controller with FSBUS capability, the DST-1 also supports digital delivery of edge data. This feature is automatically detected and enabled when connected to a supporting controller.

The controller may need additional configuration to use the digital data delivery.

The icon appears in the status bar when this link is active. This connection supports delivery of up to four edge signals corresponding to the four possible edges configured in the DST-1 edge processing options. By default, only one edge is configured.

9.0 Sensor maintenance

9.1 Backup and restore device settings

You can create up to five device restoration points in the device internal memory or to an external USB drive. Each of these restoration files saves all device settings, except for

1) the sensor pairing key and
2) password security settings.

When a USB memory stick is inserted, it takes precedence over the DST-1 internal memory. The display will show only the backup points created on the memory stick. When the memory stick is removed, the DST-1 internal memory is displayed.

9.1.1 Save device settings

Save to internal memory

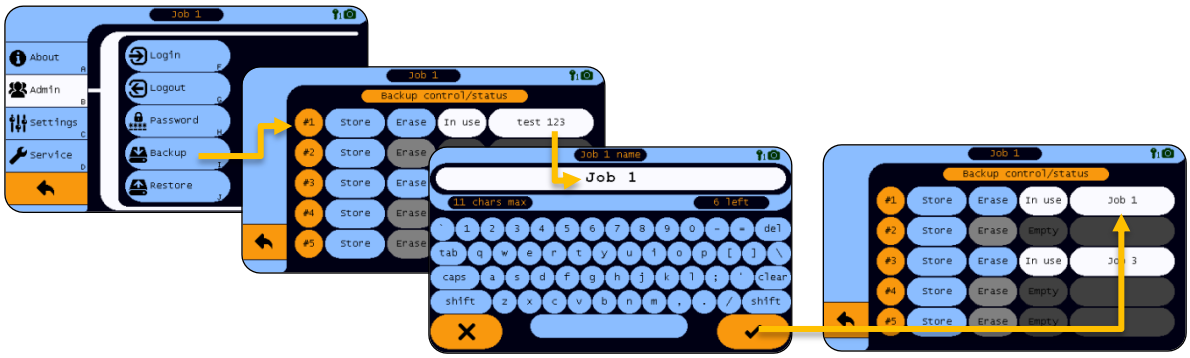
The DST-1 sensing element must be connected to the USB port on the operator interface.

Save to external memory device

Replace the DST-1 sensing element with a USB flash drive.

From the main screen, select **ADVANCED SETUP** > **ADMIN** > **BACKUP**

1. Select a numbered placeholder; the keyboard opens.
2. Enter a name for the restoration file.
3. Press to complete the save function or
   Press to cancel.
4. Press to return to the main screen.



Sensor pairing key

The sensor pairing key is located separately and is not backed up. You can restore it manually by re-entering the pairing code. The pairing code is located on the back side of the sensing element. You will only need the pairing code when replacing the sensing element or the OI (page 56).

9.1.2 Restore device settings

You can restore device configuration settings from the device internal memory storage or from an external USB drive.

When a USB memory stick is inserted, it takes precedence over the DST-1 internal memory. The display will show only the backup points created on the memory stick. When the memory stick is removed, the DST-1 internal memory is displayed.

File saved in internal memory

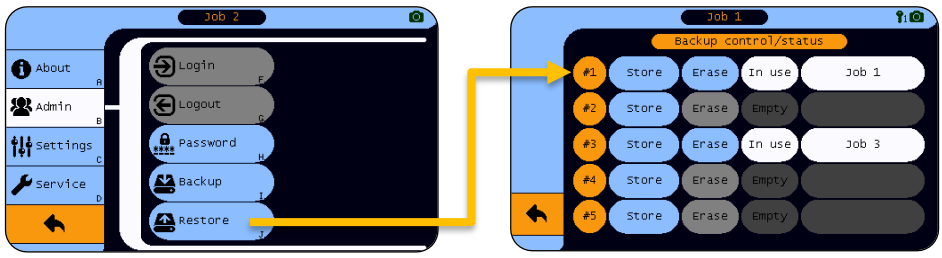
The DST-1 sensing element must be connected to the USB port on the operator interface.

Files saved on external memory device

Replace the DST-1 sensing element with the memory stick that holds your backup files.

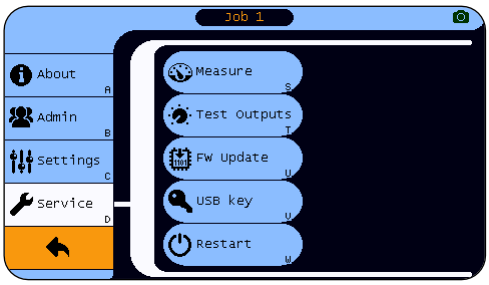
From the main screen, select
ADVANCED SETUP > ADMIN > RESTORE

1. Select a numbered placeholder and enter a name for the restoration file.
2. Press to complete the restore function or
   Press to cancel.
3. Answer YES to proceed with restore function; answer YES to restart the system (recommended).
4. Press to return to the main menu.

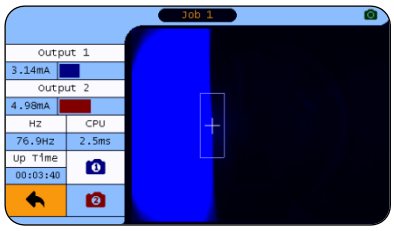


After restoring files from a backup, you will need to reconfigure password security settings.

10.0 Service Menu



The Service menu contains the following group of utilities.

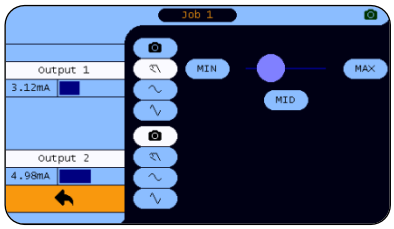


MEASURE

MAIN SCREEN > ADVANCED SETUP > SERVICE > 

Monitor analog outputs in current time.

Use to troubleshoot device outputs and performance.



TEST OUTPUTS

MAIN SCREEN > ADVANCED SETUP > SERVICE 

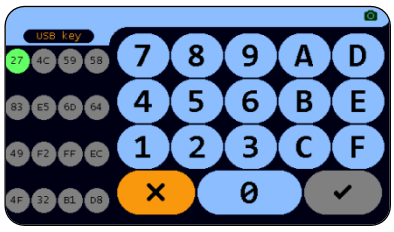
Analog outputs

You can manually modify each output to generate sine-wave and saw-tooth signals.

FW UPDATE

MAIN SCREEN > ADVANCED SETUP > SERVICE 

Update DST-1 OI firmware or return to a previous version; page 55.



USB PAIRING KEY

MAIN SCREEN > ADVANCED SETUP > SERVICE > 

Pair the DST-1 sensing element and OI components; the keypad is used to enter a new device code after replacing a sensing element or OI. Left side of screen displays the last pairing code used. See page 56.

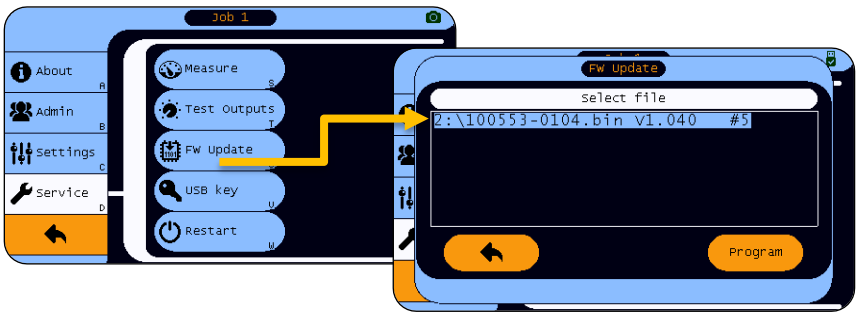
RESTART

MAIN SCREEN > ADVANCED SETUP > SERVICE 

Force a device restart.

10.1 Update firmware

1. Back up your device configuration. (See page 9.0.)
2. Shutting off the power to the OI is optional.
   Remove the sensing element from USB port located on the back side of the operator interface.
3. Plug in USB drive that holds the new firmware file(s). Confirm it by green USB memory icon on the OI screen.
4. At the main screen, select
   ADVANCED SETUP > SERVICE > FW UPDATE.
5. Select/highlight the firmware file from the list.
6. Press PROGRAM. The device will restart automatically.



10.2 Replacing DST-1 components

10.2.1 Replacing the sensing element

Note: Shutting off the power to the OI is optional.

1. Remove the existing sensing element from USB port located on the back side of the operator interface.
2. Plug the new sensing element into the USB port.
3. Pair the new sensing element with the OI component.

10.2.2 Replacing the operator interface

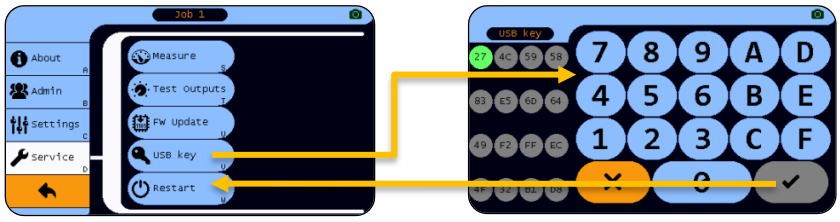
To simplify replacing the OI with new unit, you must have the old device configuration saved on a USB flash drive. The device backup and restoration procedure is described on page 52.

10.2.3 Pairing key code

Any time you replace a component of the DST-1, you must pair the components for proper operation.

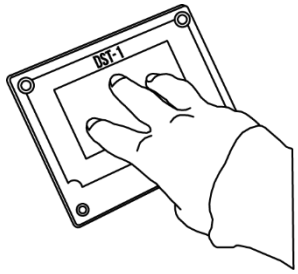
The DST-1 backup files do not include the sensor pairing key code, which is essential for proper operation. Locate the code on the back side of the sensing element, and then:

1. From the main screen, Select ADVANCED SETUP > SERVICE > USB KEY; a keypad opens.
2. Locate the pairing key code on the back side of the sensing element; enter all sixteen pairs of characters. Entry of each pair is confirmed by a green light on the screen.
3. Confirm the code entry and press ✓ to return to previous screen.
4. Select ADVANCED SETUP > SERVICE > REBOOT and confirm YES when prompted to reboot the device.



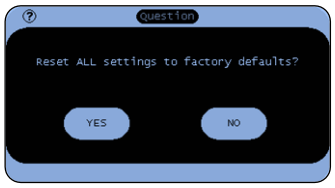
To edit the key code entry: Touch any of the 16 key buttons to begin editing from that point.

11.0 Device recovery options



Reset device configuration to default factory settings

1. Turn off power to the DST-1 unit.
2. Turn power back on — when the Maxcess logo appears, place and hold three fingers on the screen until the confirmation screen appears.



YES = reset device configuration

NO = cancel to continue without reset

12.0 Troubleshooting

Fault diagnostics and rectification

An incorrect setting on the DST-1 OI is often the cause of incorrect or undesirable guiding characteristics. Faults and the procedures for rectifying the faults are described below.

Fault Description	Probable Cause	Remedy
OI does not display a web image	OI does not see the sensing element	Check USB key settings. Re-enter the pairing key code. Perform power cycle
	Sensing element connection is lost	Re-set the USB cable and perform sensor power cycle
		Replace the sensing element
OI web image display is poor quality	Sensing element lens is dirty	Clean the sensing element lens.
	Wrong sensor backlight settings	Check CAMERA parameter group settings
		Re-load Job N configuration
Auto-Setup function fails to find an edge	Sensing element lens is dirty	Clean the sensing element lens
	Web positioning problems	Check and adjust distance to a web.
		Check and adjust sensing element positioning
	Wrong web material type for Auto-setup	Refer to the manual for the auto-setup conditions
OI security access is denied	Password mismatch	Contact Maxcess technical support to re-set password
OI display is dark	OI power connection	Check power/signal connection and re-connect
	OI internal failure	Replace OI unit
Manual job setup procedure fails to find a web edge	Distance to a web	Check web setup
	Sensor backlight settings	Check backlight settings
	Incorrect edge function	Check edge detection function settings
	Incorrect ROI	Check ROI settings
	Special case web material	Contact Maxcess technical support

13.0 Specifications

General specifications		
OI display type		Color, touchscreen, 480 x 272 px
OI connection type		USB 2.0
Sensor working spectrum		NIR (Near Infrared)
Operating temperature range	°C [°F]	0 to 60 [32 to 140]
Storage temperature range	°C [°F]	-10 to 80 [14 to 176]
Physical specifications		
Sensing element dimensions	mm [inches]	112 x 18 x 34 (L x W x H) [4.4 x 0.7 x 1.3] (L x W x H)
OI dimensions	mm [inches]	156 x 66 x 126 (L x W x H) [6.1 x 2.6 x 5.0] (L x W x H)
Sensing element weight	g [lb]	200 [0.45]
OI weight	g [lb]	1300 [2.9]
Sensing element bracket weight	g [lb]	140 [0.3]
Electrical		
Operating current minimum requirements	VDC/A	24/0.3 12/0.5
Operating voltage input range	VDC	10 to 26
Analog output range	mA	0 to 20 (at nominal load 100 Ω)
Analog output temperature drift	mA/°C	10^{-5} (in range 0 to 60°C)
Digital communication interface	RS-485	Fife Sensor Serial Bus
Field of view (at distance)	mm (at mm)	70 (at 20) to 250 (at 250)
Maximum field of view (at distance)	mm (at mm)	300 (at 200)
Working resolution	Web distance in mm	Resolution in mm [inches]
For output range 0 to 20 mA*	10	0.013 [0.0005]
	20	0.025 [0.0010]
	30	0.033 [0.0013]
	40	0.048 [0.0019]
	50	0.059 [0.0023]
	60	0.074 [0.0029]
	70	0.090 [0.0035]
Distance measuring range	mm [inches]	20 to 250 [0.8 to 10]
Sensor update rate	Hz	83
OI screen update rate	Hz	10
Boot time to operation state	Seconds	8
Certifications		
Product certifications		CE
Protection class		IP54

* Note: The output range 0 to 10 mA has half of the resolution listed in the table.

14.0 Service

To request service or to get replacement parts, contact one of the following addresses or your regional office.

Fife
222 West Memorial Rd.
Oklahoma City, OK, 73114
USA
Phone: 1.405.755.1600
Fax: 1.405.755.8425
Web: www.maxcessintl.com

Fife-Tidland GmbH
Max-Planck-Strasse 8
65779 Kelkheim
Deutschland
Telefon: +49.6195.7002.0
Fax: +49.6195.7002.933
Web: www.maxcess.eu

When ordering replacement parts, please indicate, where possible, part number, drawing number and model description.

If it is necessary to return the product for service, take care to properly package the unit to prevent damage during shipment. If possible, use the original shipping containers.