



COBRA

Handheld Pipe-Weld Scanner

User's Manual

DMTA-20006-01EN — Rev. D
September 2022

This instruction manual contains essential information on how to use this Evident product safely and effectively. Before using this product, thoroughly review this instruction manual. Use the product as instructed. Keep this instruction manual in a safe, accessible location.

EVIDENT CANADA, 3415, Rue Pierre-Ardouin, Québec (QC) G1P 0B3 Canada

Copyright © 2022 by Evident. All rights reserved. No part of this publication may be reproduced, translated, or distributed without the express written permission of Evident.

This document was prepared with particular attention to usage to ensure the accuracy of the information contained therein, and corresponds to the version of the product manufactured prior to the date appearing on the title page. There could, however, be some differences between the manual and the product if the product was modified thereafter.

The information contained in this document is subject to change without notice.

Part number: DMTA-20006-01EN

Rev. D

September 2022

Printed in Canada

All brands are trademarks or registered trademarks of their respective owners and third party entities.

Table of Contents

Important Information — Please Read Before Use	7
Intended Use	7
Instruction Manual	7
Device Compatibility	8
Repair and Modification	8
Safety Symbols	8
Safety Signal Words	9
Note Signal Words	10
Safety	10
Warnings	10
Battery Precautions	11
Regulations for Shipping Products with Lithium-Ion Batteries	13
Equipment Disposal	13
BC (Battery Charger - California, USA Community)	13
CE (European Community)	14
UKCA (United Kingdom)	14
RCM (Australia)	14
WEEE Directive	14
China RoHS	15
Korea Communications Commission (KCC)	16
EMC Directive Compliance	16
FCC (USA) Compliance	16
ICES-001 (Canada) Compliance	18
Warranty Information	18
Technical Support	19
Introduction	21
1. COBRA Scanner Description	23
1.1 Scanner Components	24

1.2	About the Setup Templates	27
1.3	Required Tools for Scanner Setup	29
2.	Setup and Operation	31
2.1	Removing the Probe	31
2.2	Installing the Probe	32
2.3	Changing the Wedge	35
2.4	Adjusting the Length of Exposed Cables and Tubes	36
2.5	Configuring the Scanner Using the Setup Template	37
2.6	Configuring the Scanner without the Setup Template	45
2.7	Using the Wedge-Separation Indicators	51
2.8	Operating the Scanner	54
3.	Maintenance and Troubleshooting	59
3.1	Cleaning the Scanner	59
3.2	Troubleshooting	59
4.	Accessories and Spare Parts	63
4.1	Part Order Numbers	64
4.2	Spare Parts	70
5.	Specifications	73
5.1	General and Operating Environment Specifications	73
5.2	Connector Reference	74
5.3	Probe Specifications	76
5.4	Scanner Setup Charts	76
	List of Figures	79
	List of Tables	81

List of Abbreviations

AOD	axial outside diameter
CE	European community
EFUP	environment-friendly use period
ID	inside diameter
LW	longitudinal wave
OD	outside diameters
SW	shear wave
UT	ultrasonic testing

Important Information — Please Read Before Use

Intended Use

The COBRA is designed to perform nondestructive inspections on industrial and commercial materials.



WARNING

Do not use the COBRA for any purpose other than its intended use. It must never be used to inspect or examine human or animal body parts.

Instruction Manual

This instruction manual contains essential information on how to use this product safely and effectively. Before using this product, thoroughly review this instruction manual. Use the product as instructed. Keep this instruction manual in a safe, accessible location.

IMPORTANT

Some of the details of components illustrated in this manual may differ from the components installed on your device. However, the operating principles remain the same.

Device Compatibility

Only use this device with the approved ancillary equipment provided by Evident. Equipment provided by Evident and approved for use with this device is described later in this manual.



CAUTION

Always use equipment and accessories that meet Evident specifications. Using incompatible equipment could cause equipment malfunction and/or damage, or human injury.

Repair and Modification

This device does not contain any user-serviceable parts. Opening the device might void the warranty.



CAUTION

In order to prevent human injury and/or equipment damage, do not disassemble, modify, or attempt to repair the device.

Safety Symbols

The following safety symbols might appear on the device and in the instruction manual:



General warning symbol

This symbol is used to alert the user to potential hazards. All safety messages that follow this symbol shall be obeyed to avoid possible harm or material damage.



High voltage warning symbol

This symbol is used to alert the user to potential electric shock hazards greater than 1000 volts. All safety messages that follow this symbol shall be obeyed to avoid possible harm.

Safety Signal Words

The following safety symbols might appear in the documentation of the device:



DANGER

The DANGER signal word indicates an imminently hazardous situation. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, will result in death or serious personal injury. Do not proceed beyond a DANGER signal word until the indicated conditions are fully understood and met.



WARNING

The WARNING signal word indicates a potentially hazardous situation. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in death or serious personal injury. Do not proceed beyond a WARNING signal word until the indicated conditions are fully understood and met.



CAUTION

The CAUTION signal word indicates a potentially hazardous situation. It calls attention to an operating procedure, practice, or the like, which, if not correctly performed or adhered to, may result in minor or moderate personal injury, material damage, particularly to the product, destruction of part or all of the product, or loss of data. Do not proceed beyond a CAUTION signal word until the indicated conditions are fully understood and met.

Note Signal Words

The following note signal words could appear in the documentation of the device:

IMPORTANT

The IMPORTANT signal word calls attention to a note that provides important information, or information essential to the completion of a task.

NOTE

The NOTE signal word calls attention to an operating procedure, practice, or the like, which requires special attention. A note also denotes related parenthetical information that is useful, but not imperative.

TIP

The TIP signal word calls attention to a type of note that helps you apply the techniques and procedures described in the manual to your specific needs, or provides hints on how to effectively use the capabilities of the product.

Safety

Before turning on the device, verify that the correct safety precautions have been taken (see the following warnings). In addition, note the external markings on the device, which are described under “Safety Symbols.”

Warnings



WARNING

General Warnings

- Carefully read the instructions contained in this instruction manual prior to turning on the device.
- Keep this instruction manual in a safe place for further reference.

- Follow the installation and operation procedures.
- It is imperative to respect the safety warnings on the device and in this instruction manual.
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment could be impaired.
- Do not install substitute parts or perform any unauthorized modification to the device.
- Service instructions, when applicable, are for trained service personnel. To avoid the risk of electric shock, do not perform any work on the device unless qualified to do so. For any problem or question regarding this device, contact Evident or an authorized Evident representative.
- Do not touch the connectors directly by hand. Otherwise, a malfunction or electric shock may result.
- Do not allow metallic or foreign objects to enter the device through connectors or any other openings. Otherwise, a malfunction or electric shock may result.

**WARNING****Electrical Warning**

The device must only be connected to a power source corresponding to the type indicated on the rating label.

**CAUTION**

If a non-approved power supply cord not dedicated to Evident products is used, Evident will not be able to ensure the electrical safety of the equipment.

Battery Precautions**CAUTION**

- Before disposing of a battery, check your local laws, rules, and regulations, and follow them accordingly.

- Transportation of lithium-ion batteries is regulated by the United Nations under the United Nations Recommendations on the Transport of Dangerous Goods. It is expected that governments, intergovernmental organizations, and other international organizations shall conform to the principles laid down in these regulations, thus contributing to worldwide harmonization in this field. These international organizations include the International Civil Aviation organization (ICAO), the International Air Transport Association (IATA), the International Maritime Organization (IMO), the US Department of Transportation (USDOT), Transport Canada (TC), and others. Please contact the transporter and confirm current regulations before transportation of lithium-ion batteries.
- For California (USA) only:
The device may contain a CR battery. The CR battery contains perchlorate material, and special handling may be required. Refer to <http://www.dtsc.ca.gov/hazardouswaste/perchlorate>.
- Do not open, crush, or perforate batteries; doing so could cause injury.
- Do not incinerate batteries. Keep batteries away from fire and other sources of extreme heat. Exposing batteries to extreme heat (over 80 °C) could result in an explosion or personal injury.
- Do not drop, hit, or otherwise abuse a battery, as doing so could expose the cell contents, which are corrosive and explosive.
- Do not short-circuit the battery terminals. A short circuit could cause injury and severe damage to a battery making it unusable.
- Do not expose a battery to moisture or rain; doing so could cause an electric shock.
- Only use an external charger approved by Evident to charge the batteries.
- Only use batteries supplied by Evident.
- Do not store batteries that have less than 40 % remaining charge. Recharge batteries to between 40 % and 80 % capacity before storing them.
- During storage, keep the battery charge between 40 % and 80 %.
- Do not leave batteries in the COBRA unit during device storage.

Regulations for Shipping Products with Lithium-Ion Batteries

IMPORTANT

When shipping a Li-ion battery or batteries, be sure to follow all local transportation regulations.



WARNING

Damaged batteries cannot be shipped through normal routes — DO NOT ship damaged batteries to Evident. Contact your local Evident representative or material disposal professionals.

Equipment Disposal

Before disposing of the COBRA, check your local laws, rules, and regulations, and follow them accordingly.

BC (Battery Charger - California, USA Community)



The BC marking indicates that this product has been tested and complies with the Appliance Efficiency Regulations as stated in the California Code of Regulations Title 20, Sections 1601 through 1608 for Battery Charger Systems. The internal battery charger within this device has been tested and certified pursuant to the California Energy Commission's (CEC) requirements; this device is listed on the online CEC's (T20) database.

CE (European Community)



This device complies with the requirements of directive 2014/30/EU concerning electromagnetic compatibility, directive 2014/35/EU concerning low voltage, and directive 2015/863 which amends 2011/65/EU concerning restriction of hazardous substances (RoHS). The CE marking is a declaration that this product conforms to all the applicable directives of the European Community.

UKCA (United Kingdom)



This device complies with the requirements of the Electromagnetic Compatibility Regulations 2016, the Electrical Equipment (Safety) Regulations 2016, and the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012. The UKCA marking indicates compliance with the above regulations.

RCM (Australia)



The regulatory compliance mark (RCM) label indicates that the product complies with all applicable standards, and has been registered with the Australian Communications and Media Authority (ACMA) for placement on the Australian market.

WEEE Directive



In accordance with European Directive 2012/19/EU on Waste Electrical and Electronic Equipment (WEEE), this symbol indicates that the product must not be disposed of as unsorted municipal waste, but should be collected separately. Refer to your local Evident distributor for return and/or collection systems available in your country.



China RoHS

China RoHS is the term used by industry generally to describe legislation implemented by the Ministry of Information Industry (MII) in the People's Republic of China for the control of pollution by electronic information products (EIP).



The China RoHS mark indicates the product's Environment-Friendly Use Period (EFUP). The EFUP is defined as the number of years for which listed controlled substances will not leak or chemically deteriorate while in the product. The EFUP for the COBRA has been determined to be 15 years.

Note: The Environment-Friendly Use Period (EFUP) is not meant to be interpreted as the period assuring functionality and product performance.



本标志是根据“电器电子产品有害物质限制使用管理办法”以及“电子电气产品有害物质限制使用标识要求”的规定，适用于在中国销售的电器电子产品上的电器电子产品有害物质使用限制标志。

电器电子产品有
害物质限制使用
标志

（注意）电器电子产品有害物质限制使用标志内的数字为在正常的使用条件下有害物质等不泄漏的期限，不是保证产品功能性能的期间。

产品中有害物质的名称及含量

部件名称		有害物质					
		铅及其化合物 (Pb)	汞及其化合物 (Hg)	镉及其化合物 (Cd)	六价铬及其化合物 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
主体	机构部件	×	○	○	○	○	○
	光学部件	×	○	○	○	○	○
	电气部件	×	○	○	○	○	○

产品中有害物质的名称及含量

部件名称	有害物质					
	铅及其化合物 (Pb)	汞及其化合物 (Hg)	镉及其化合物 (Cd)	六价铬及其化合物 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
附件	×	○	○	○	○	○

本表格依据 SJ/T 11364 的规定编制。
○：表示该有害物质在该部件所有均质材料中的含量均在 GB/T26572 规定的限量要求以下。
×：表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T26572 规定的限量要求。

Korea Communications Commission (KCC)



Seller and user shall be noticed that this equipment is suitable for electromagnetic equipment for office work (class A) and it can be used outside the home. This device complies with the EMC requirements of Korea.

이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서 가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다.

EMC Directive Compliance

This equipment generates and uses radio-frequency energy and, if not installed and used properly (that is, in strict accordance with the manufacturer's instructions), may cause interference. The COBRA has been tested and found to comply with the limits for an industrial device in accordance with the specifications of the EMC directive.

FCC (USA) Compliance

NOTE

This product 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 product is operated in a

commercial environment. This product generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, might cause harmful interference to radio communications. Operation of this product in a residential area is likely to cause harmful interference, in which case you will be required to correct the interference at your own expense.

IMPORTANT

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the product.

FCC Supplier's Declaration of Conformity

Hereby declares that the product,

Product name: COBRA

Model: COBRA-MR/COBRA-CW

Conforms to the following specifications:

FCC Part 15, Subpart B, Section 15.107 and Section 15.109.

Supplementary information:

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.
- (2) This device must accept any interference received, including interference that may cause undesired operation.

Responsible party name:

EVIDENT CANADA

Address:

3415, Rue Pierre-Ardouin Québec (QC) G1P 0B3 Canada

Phone number:

+1 781-419-3900

ICES-001 (Canada) Compliance

This Class A digital apparatus complies with Canadian ICES-001.

Cet appareil numérique de la classe A est conforme à la norme NMB-001 du Canada.

Warranty Information

Evident guarantees your Evident product to be free from defects in materials and workmanship for a specific period, and in accordance with conditions specified in the Terms and Conditions available at <https://www.olympus-ims.com/en/terms/>.

The Evident warranty only covers equipment that has been used in a proper manner, as described in this instruction manual, and that has not been subjected to excessive abuse, attempted unauthorized repair, or modification.

Inspect materials thoroughly on receipt for evidence of external or internal damage that might have occurred during shipment. Immediately notify the carrier making the delivery of any damage, because the carrier is normally liable for damage during shipment. Retain packing materials, waybills, and other shipping documentation needed in order to file a damage claim. After notifying the carrier, contact Evident for assistance with the damage claim and equipment replacement, if necessary.

This instruction manual explains the proper operation of your Evident product. The information contained herein is intended solely as a teaching aid, and shall not be used in any particular application without independent testing and/or verification by the operator or the supervisor. Such independent verification of procedures becomes increasingly important as the criticality of the application increases. For this reason, Evident makes no warranty, expressed or implied, that the techniques, examples, or procedures described herein are consistent with industry standards, nor that they meet the requirements of any particular application.

Evident reserves the right to modify any product without incurring the responsibility for modifying previously manufactured products.

Technical Support

Evident is firmly committed to providing the highest level of customer service and product support. If you experience any difficulties when using our product, or if it fails to operate as described in the documentation, first consult the user's manual, and then, if you are still in need of assistance, contact our After-Sales Service. To locate the nearest service center, visit the Service Centers page on the Evident Scientific Web site.

Introduction

This manual provides instructions for assembling, installing, and operating the COBRA scanner.

The COBRA scanner is a manual weld inspection scanner for the nondestructive inspection of pipes with outside diameters ranging from 21.3 mm to 114.3 mm (0.84 in. to 4.50 in.). The COBRA scanner typically uses the OmniScan (models can vary) with a 16:64 or a 16:128 module and the OmniScan MXU software to inspect circumferential welds on small-diameter pipes (see Figure i-1 on page 21).

Note: Instrument model and connector type can vary.



Figure i-1 The OmniScan MX2 and the COBRA scanner

With its very slim design, this manual scanner inspects pipes in limited access areas where minimal clearance is required (see Figure i-2 on page 22). Adjacent obstructions such as piping, supports, and structures can be as close as 12 mm (0.5 in.). This spring-loaded scanner is designed to hold onto carbon steel and stainless steel pipes of different diameters.



Figure i-2 Operating the COBRA scanner in a limited access area

The COBRA scanner is characterized by its smooth-rolling encoded movement enabling precise data acquisition. The scanner can hold two phased array probes for a complete inspection of the weld in one pass. For pipe-to-component inspections, the scanner can be quickly configured to make one-sided inspections with only one probe.

This Evident solution uses low-profile phased array probes with optimized elevation focusing, which improves the detection of small defects in thin-walled pipes. Specially designed low-profile wedges that fit each pipe diameter covered by the scanner are also offered to complete the solution. The COBRA scanner ensures stable, constant, and strong pressure thus providing good UT signals and precise encoding around the full circumference of the pipe. This complete solution package is small and lightweight for easy transport. The scanner is also waterproof, rust-free, and CE compliant.

1. COBRA Scanner Description

The COBRA scanner is a low profile encoded scanner supporting one or two probes. The COBRA scanner is provided with a kit of parts that you can easily assemble, thus configuring the scanner to fit on the outside diameter of the pipe to be inspected (see Figure 1-1 on page 23).

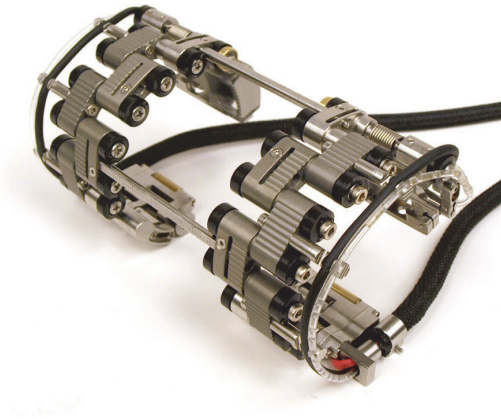


Figure 1-1 The COBRA scanner

NOTE

The term pipe is used in this document as a generic term to represent tube, pipe, or cylindrical parts.

1.1 Scanner Components

The COBRA scanner components are probes, wedges, probe supports, various link types, tails, and crossbars. Figure 1-2 on page 25 illustrates a two-sided scanner configuration laid flat.

You can configure the scanner to fit on a specific pipe outside diameter by assembling the appropriate number and type of links. The tail and probe-holder parts also include diameter fine-tuning adjustments. Refer to the scanner setup charts for details (Table 13 on page 77 for pipe OD smaller than 63.5 mm [2.50 in.] and Table 14 on page 78 for pipe OD larger than 63.5 mm [2.50 in.]). Pairs of wedges with appropriate curvatures are used to cover the pipe outside-diameter range (see Table 5 on page 67 for the wedge selection chart). Graduated crossbars are used to adjust the distance between the wedges. Figure 1-3 on page 26 illustrates the various types of COBRA scanner links.

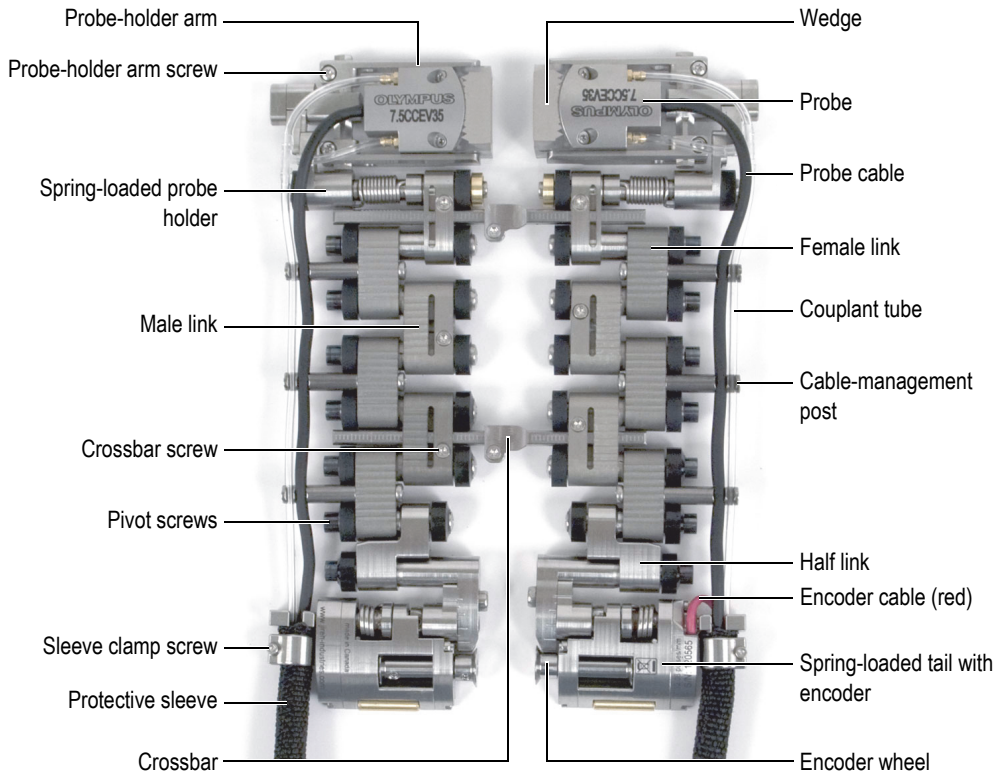


Figure 1-2 Scanner component identification

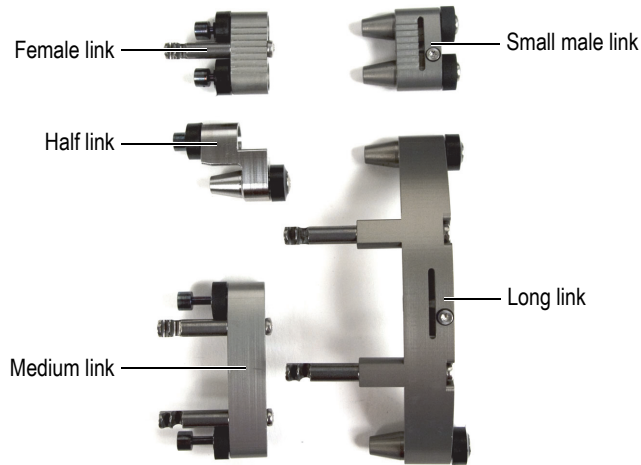


Figure 1-3 Link types

In Figure 1-2 on page 25, the tail component on the right-hand side includes the encoder that provides the position of the scanner around the pipe. You can also use only the encoder side of the scanner to inspect the pipe-to-component interfaces (see Figure 1-4 on page 26).

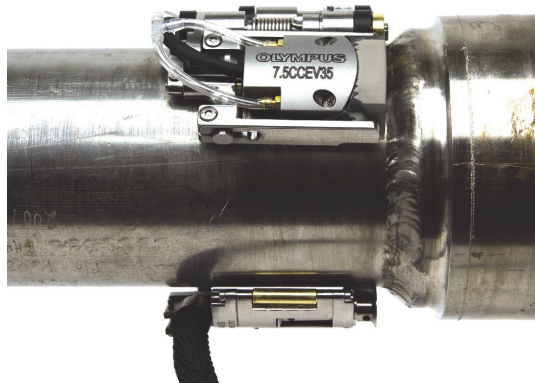


Figure 1-4 Pipe-to-component interface inspection with the one-sided scanner configuration

1.2 About the Setup Templates

The COBRA scanner comes with two setup templates (see Figure 1-5 on page 27). The setup templates help you to quickly and easily assemble and configure the scanner for a given pipe or tube outside diameter without requiring the use of an actual pipe sample (see “Configuring the Scanner Using the Setup Template” on page 37). The setup templates provide configuration patterns for standard tube and pipe outside diameters (see Table 1 on page 28). You cannot use the setup templates for nonstandard pipe sizes (see “Configuring the Scanner without the Setup Template” on page 45).

The setup templates have configuration patterns on both sides. The encoder-side scanner-configuration patterns are on one side of the setup templates, while the configuration patterns for the other side of the scanner are on the other side of the setup templates.

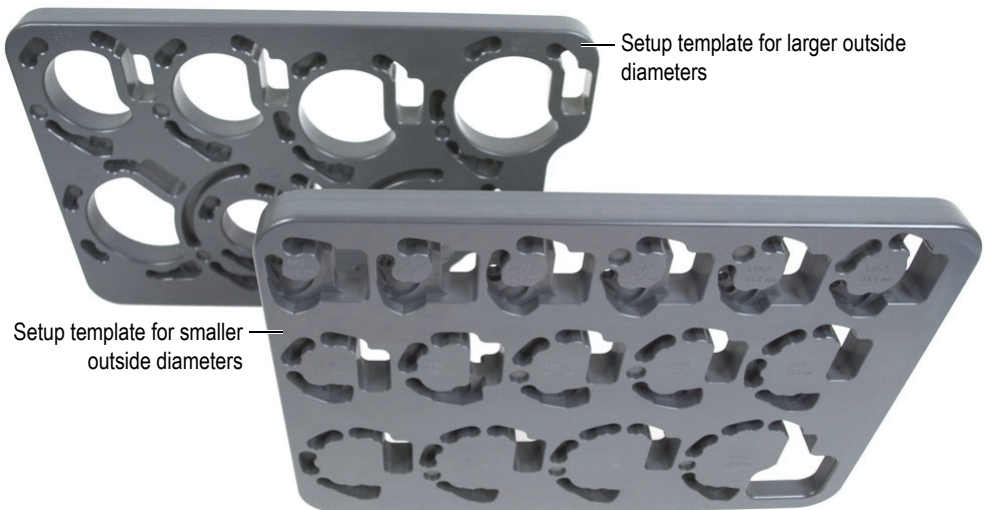


Figure 1-5 The setup templates

Table 1 Standard tube and pipe ODs supported by the setup templates

Standard tube OD		Standard pipe OD		Setup template for smaller sizes	Setup template for larger sizes
(in.)	(mm)	(in.)	(mm)		
		0.840	21.34	✓	
0.875	22.23	—	—	✓	
1.000	25.40	—	—	✓	
—	—	1.050	26.67	✓	
1.125	28.58	—	—	✓	
1.315	33.40	1.315	33.40	✓	
1.375	34.93	—	—	✓	
1.500	38.10	—	—	✓	
—	—	1.660	42.16	✓	
1.750	44.45			✓	
—	—	1.900	48.26	✓	
2.000	50.80	—	—	✓	
2.250	57.15	—	—	✓	
—	—	2.375	60.33	✓	
2.500	63.50	—	—	✓	
—	—	2.875	72.39		✓
3.000	76.20	—	—		✓
3.250	82.55	—	—		✓
3.500	88.90	3.500	88.90		✓
3.750	95.25	—	—		✓
4.000	101.6	4.000	101.6		✓
4.500	114.3	4.500	114.3		✓

1.3 Required Tools for Scanner Setup

The few tools required for the assembly, reconfiguration, and adjustment of the scanner are included with the COBRA scanner (see Table 2 on page 29 and Figure 1-6 on page 29).

Table 2 Required tools (included with the scanner)

Quantity	Description
1	T6 Torx screw driver
1	2.5 mm hexagonal screw driver
1	Phillips #0 screw driver
1	Loom installation tool (to insert cables and tubes in the protective sleeve)

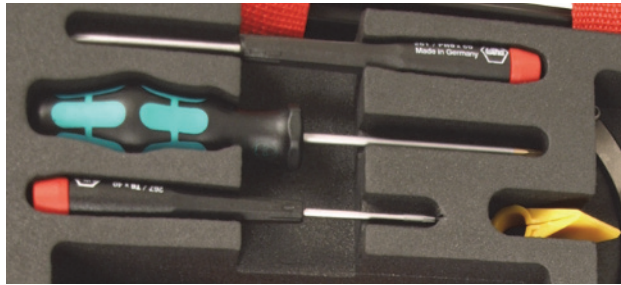


Figure 1-6 Tools included with the COBRA scanner

2. Setup and Operation

This chapter contains the procedures needed to set up and operate the COBRA scanner.



CAUTION

To prevent damage to the scanner components, the pipe on which you install the scanner must be clean, and free of debris, scale, soot, or other contaminants.

2.1 Removing the Probe

When ordered as a kit (COBRA-K-XXX), the one or two probes are already installed on the COBRA scanner at the factory. Therefore, when you want to configure the scanner using the setup template, you need to remove the probe from the wedge.

If you need to remove a probe, because the probe cable is permanently attached to the probe, you will need to extract and reinsert the cable and the couplant tubes in the protective sleeve.

To remove the probe

1. Unscrew the probe from the wedge.
2. Unclip the probe cable and couplant tube from the cable-management posts.

3. If you need to replace the probe:
 - a) Using the T6 Torx screw driver, remove the sleeve clamp screw, and then slide the protective sleeve and sleeve clamp away from the tail (see Figure 2-1 on page 32).

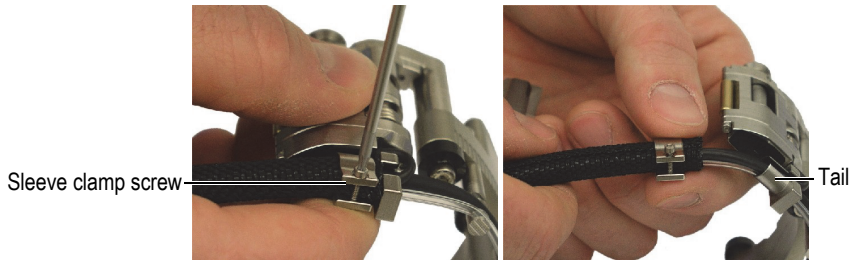


Figure 2-1 Removing the sleeve clamp

- b) Remove the sleeve clamp completely.
 - c) Extract the probe cable, couplant tube, and encoder cable (encoder side tail only) from the protective sleeve.

2.2 Installing the Probe

To install the probe

1. Insert the probe cable, couplant tube, and encoder cable (encoder side tail only) in the cable-management portion of the tail.
2. Using the yellow loom installation tool, insert the protective sleeve over the cables and the tube as follows (see Figure 2-2 on page 33):
 - a) Starting at the scanner end, close the loom tool over the bundle with the pointed shoe portion pointing away from the scanner (see illustration A).
 - b) Slide the protective sleeve over the pointed shoe portion of the tool so that it spreads open, follows the tool, and starts to wrap itself around the bundle (see illustrations C and D).
 - c) While holding the portion of the protective sleeve that is already wrapped around the bundle, slide the tool away from the scanner so that the remainder of the protective sleeve wraps around the bundle (see illustration D).

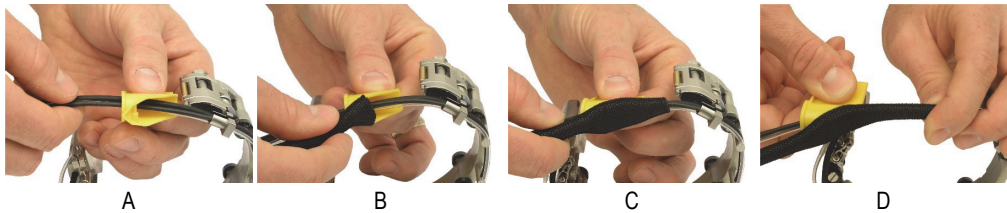


Figure 2-2 Installing the protective sleeve

3. Install the sleeve clamp as follows (see Figure 2-3 on page 33):
 - a) Install the sleeve clamp over the bundle and then slide it over the protective sleeve.
 - b) Install the sleeve clamp screw into the sleeve clamp so the threads of the sleeve clamp screw just start to engage in the sleeve clamp (see illustration A).
 - c) Slide the protective sleeve over the cable-management portion of the tail.
 - d) Tighten the sleeve clamp screw until sufficiently snug (see illustration B).
 - e) Ensure that the sleeve clamp is oriented so that the sleeve clamp screw does not protrude lower than the tail and rub on the inspected surface.

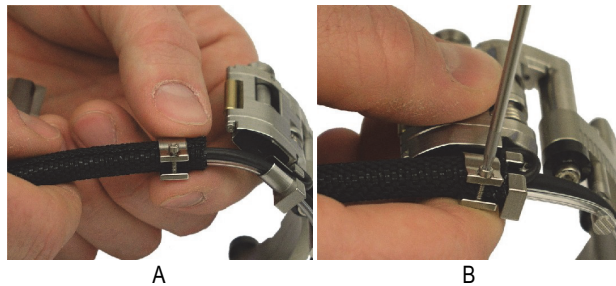


Figure 2-3 Installing the sleeve clamp

4. Assemble the probe and the wedge:
 - a) Select the appropriate wedge for the outside diameter of the pipe to be inspected (see Table 13 on page 77 and Table 14 on page 78).
 - b) Apply couplant on both the probe and the wedge interface surfaces.
 - c) Screw the probe on the wedge.

- d) Remove excess couplant.
5. Insert the inner probe-holder arm pin into the mounting hole in the wedge (see Figure 2-4 on page 34).

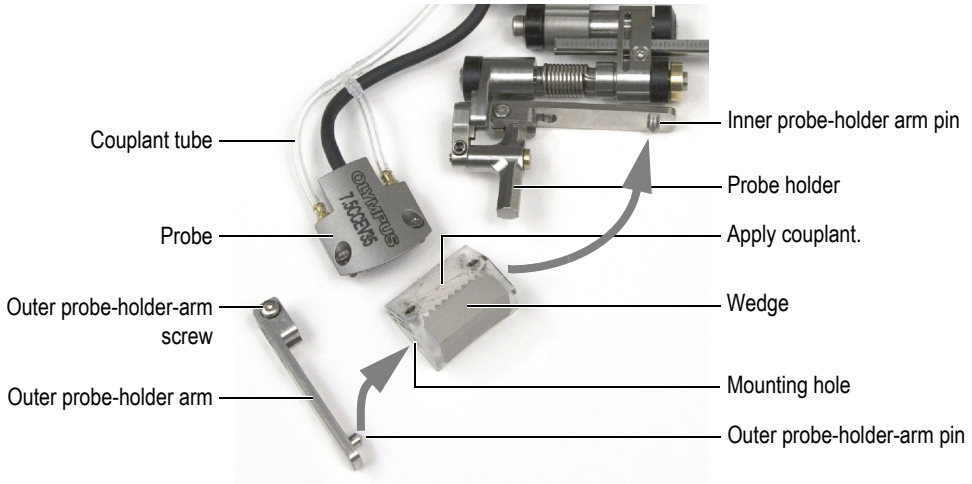


Figure 2-4 Installing the probe and the wedge on the scanner

6. Reinstall the outer probe-holder arm:
 - a) Engage the outer probe-holder-arm pin in the other mounting hole in the wedge.
 - b) Ensure that the outer probe-holder arm is parallel to the inner probe-holder arm.
 - c) Tighten the outer probe-holder-arm screw.
7. Ensure that the probe and wedge assembly is free to rotate around the pins without presenting lateral movement.
8. Adjust the length of the exposed cables and tubes (see “Adjusting the Length of Exposed Cables and Tubes” on page 36).
9. Clip the probe cable and couplant tube on the cable-management posts.

Make sure that you are inserting the probe cable in the bigger diameter groove in order to avoid damaging the outer shield.

2.3 Changing the Wedge

You need to change the wedge when you inspect a pipe with a different outside diameter.

To change the wedge

1. Remove the outer probe-holder arm (see Figure 2-5 on page 35):
 - a) Loosen without removing the probe-holder-arm screw.
 - b) Slide the arm off the probe holder.

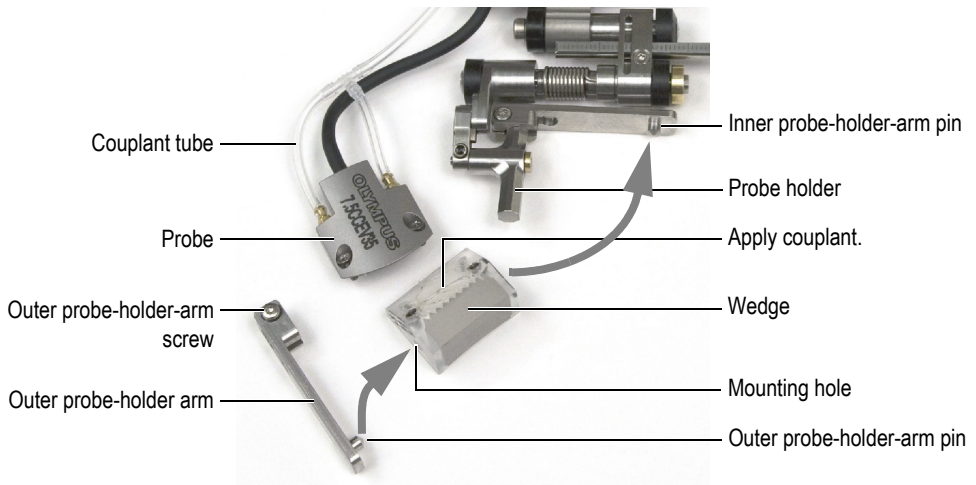


Figure 2-5 Changing the wedge on the scanner

2. Unscrew the two screws holding the probe to the wedge.
3. Assemble the probe and the new wedge:
 - a) See Table 5 on page 67 to select the appropriate wedge for the outside diameter of the pipe to be inspected.
 - b) Apply couplant on both the probe and the wedge interface surfaces.
 - c) Screw the probe on the wedge.
 - d) Remove excess couplant.
4. Insert the inner probe-holder-arm pin into the mounting hole in the wedge.

5. Reinstall the outer probe-holder arm:
 - a) Engage the outer probe-holder-arm pin in the other mounting hole in the wedge.
 - b) Ensure that the outer probe-holder arm is parallel to the inner probe-holder arm.
 - c) Tighten the outer probe-holder-arm screw.
6. Ensure that the probe and wedge assembly is free to rotate around the pins without presenting lateral movement.

2.4 Adjusting the Length of Exposed Cables and Tubes

After replacing a probe or reconfiguring the COBRA scanner for another pipe size, you need to adjust the length of exposed cables and tubes.



CAUTION

To prevent damaging the probe and encoder cable, always carefully adjust their length to fit the circumference of the scanner posts.

NOTE

You do not need to remove the sleeve clamp to adjust the length of exposed cables and tubes.

To adjust the length of exposed cables and tubes

1. To gain more exposed cables and tubes length at the scanner end, hold the free end of the protective sleeve, and pull the cables and the tubes through the protective sleeve from the scanner end.
2. To remove excess length at the scanner end, hold the tail of the scanner, and pull the cables and the tube through the protective sleeve.
3. On the scanner, clip the cables and the tube into the cable-management posts (see Figure 2-6 on page 37).

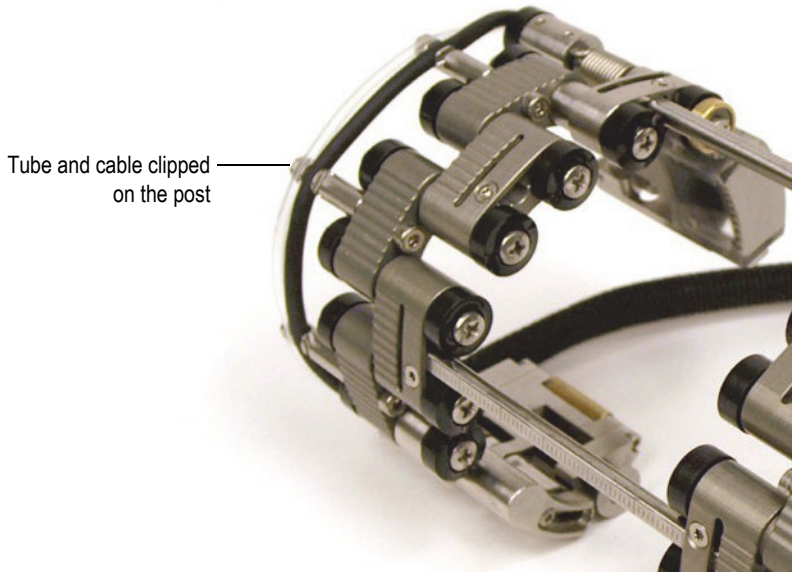


Figure 2-6 Clipping the tube and the cable on the post

2.5 Configuring the Scanner Using the Setup Template

You must configure the COBRA scanner for the pipe outside diameter on which you want to perform the inspection. The setup templates offer guiding patterns for a wide range of standard pipe outside diameters. Using a setup template simplifies the scanner setup and eliminates the need for an actual pipe sample.

To configure the scanner using the setup template

1. Disassemble the scanner components:
 - a) If applicable, loosen the crossbar screws on both sides of the scanner, and then remove the one or more crossbars.
 - b) Unclip the irrigation tubes and probe cables from the cable-management posts.
 - c) Fully loosen the self-captured pivot screws from all the links.
 - d) Disassemble the scanner components (links, crossbars, tails, and probe supports).

NOTE

If the joints do not disassemble freely with the pivot screws loose, break them loose by hand using a little force.

2. Determine how to configure the scanner:
 - a) Determine the real outside diameter of the pipe to be inspected. Do not assume that the nominal diameter is the real OD. It is often not.
 - b) See the scanner setup chart to note the probe-holder position, as well as the number and type of links required for the outside diameter of the pipe to be inspected (see Table 13 on page 77 for pipe OD smaller than 63.5 mm [2.50 in.] and Table 14 on page 78 for pipe OD larger than 63.5 mm [2.50 in.]).
 - c) On the setup template, locate the correct size setup pattern for the encoder-side configuration of the scanner (see to Figure 1-2 on page 25 to identify the encoder side components).
 - d) See Table 5 on page 67 to select the appropriate wedge for the outside diameter of the pipe to be inspected.
-

NOTE

For single probe scanning, you must use the encoder side of the scanner.

3. Configure the tail of the scanner:
 - a) Loosen the tail-adjustment screw (see Figure 2-7 on page 38) approximately half a turn so that the length-adjustment joint is free to slide.



Figure 2-7 The tail-adjustment screw

- b) Fully insert the tail assembly into its setup template pocket (see Figure 2-8 on page 39).



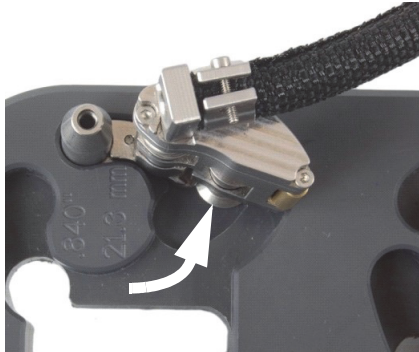
Figure 2-8 Insert the tail in its setup template pocket

- c) While holding the tail assembly in the pocket, from the opposite side, firmly tighten the tail-adjustment screw with the 2.5 mm hexagonal driver (see Figure 2-9 on page 39).

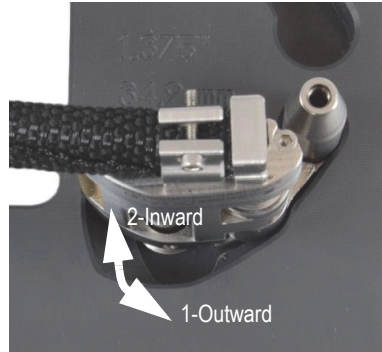


Figure 2-9 Tightening the tail-adjustment screw

- d) For the smallest outside diameters (21.3 mm to 33.4 mm [0.840 in. to 1.315 in.]), rotate the tail outward, as far as possible, so that the tail wheel is positioned farthest from the center of the setup pattern (see Figure 2-10 on page 40).
- e) For all larger diameters (33.4 mm to 114.3 mm [1.315 in. to 4.500 in.]), first fully rotate the tail outward, and then fully inward, so that the tail wheel is positioned closest to the center of the setup pattern with the correct spring load (see in Figure 2-10 on page 40).



For pipe OD smaller than 33.4 mm (1.315 in.)



For pipe OD larger than 33.4 mm (1.315 in.)

Figure 2-10 Rotating the tail to the initial position

- 4. If a half-link is required for the particular scanner configuration (see Figure 2-11 on page 41):
 - a) On the setup template, install a half-link onto the tail.
 - b) Tighten the half-link pivot screw until snug, and then loosen one turn.



Figure 2-11 Installing the half-link

5. Configure the probe holder (see Figure 2-12 on page 41):
 - a)* Loosen the probe-holder position screw.
 - b)* Slide the probe holder to the position previously noted in step 2.*b* on page 38, and then retighten the probe-holder position screw.

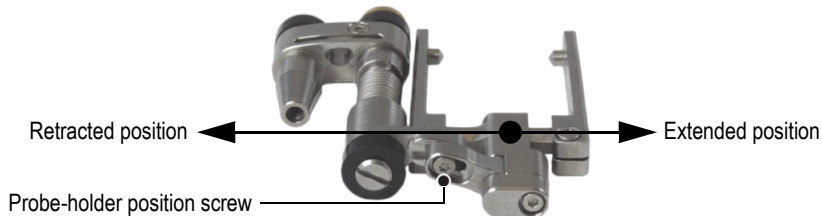


Figure 2-12 Adjusting the probe-holder position

- c)* Install the appropriate wedge and probe on the probe support (see “Changing the Wedge” on page 35 for details), while ensuring that the cable and tube are not twisted.
- d)* Adjust the length of the exposed cables and tubes, as needed (see “Adjusting the Length of Exposed Cables and Tubes” on page 36).

- e) Insert the probe-holder assembly into its setup template pocket. If required, bend the slip joint by hand until the assembly fits loosely into the setup template (see Figure 2-13 on page 42).



Figure 2-13 Installing the probe holder into the setup template

6. On the setup template, install the required male links or long links into their respective pockets (see Figure 2-14 on page 42).



Figure 2-14 Installing male links

7. On the setup template, install the required female links and/or medium links onto the links, lightly tighten all the pivot screws, and while holding down the scanner

assembly in the pockets with one hand, firmly tighten all the pivot screws (see Figure 2-15 on page 43).



Figure 2-15 Installing female and/or medium links

8. For setups on pipes with outside diameters larger than 33.4 mm (1.315 in.), rotate the probe holder inward until the wedge touches the inside edge of the through-hole portion of the template (see Figure 2-16 on page 43).



Figure 2-16 Rotating the probe holder to set the position for OD larger than 33.4 mm (1.315 in.)

9. For setups on pipes with small outside diameters ranging from 21.3 mm to 33.4 mm (0.840 in. to 1.315 in.), complete the following steps:
 - a) Lift the scanner slightly to the point where you can rotate the probe and wedge inward.

- b) Rotate the probe and wedge inward until the wedge touches the stop (see in Figure 2-17 on page 44).



Figure 2-17 Rotating the probe holder to set position for OD smaller than 33.4 mm (1.315 in.)

- c) Swing the probe-holder assembly outward until the probe and wedge can slide back into the through hole (see Figure 2-18 on page 44).
- d) Lower the scanner fully into the setup template.
- e) Rotate the tail inward, as far as possible, so that the tail wheel is positioned closest to the center of the setup pattern (see Figure 2-18 on page 44).

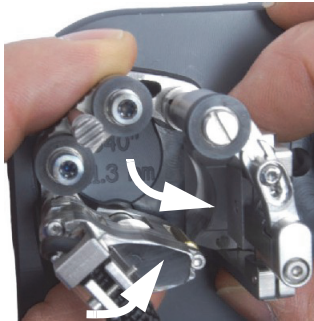


Figure 2-18 Rotating the tail to set position for a small pipe setup

10. Remove the scanner from the setup template.

11. For dual-probe scanning, repeat steps 3 to 10 for the other side of the scanner, using the opposite side of the setup template.
12. Adjust the length of the exposed cables and tubes, as needed (see “Adjusting the Length of Exposed Cables and Tubes” on page 36 for details).
13. Clip the irrigation tube and probe cable into their respective slots of the cable-management posts.
14. For dual-probe scanning, you must assemble the two halves of the scanner:
 - a) For outside diameters less than 32.5 mm (1.280 in.), use only one crossbar. Slide the crossbar through the link of each probe holder, and then clamp the crossbar in the desired position with the crossbar screw.
 - b) For outside diameters greater than 32.5 mm (1.280 in.), use two crossbars:
 - (1) Slide one crossbar through the link of each probe holder, and then clamp the cross bar in the desired position with the crossbar screws.
 - (2) Slide the second crossbar through the male links that are roughly in the center of the scanner, and then clamp the crossbar in place with the crossbar screws.
 - (3) Use the graduations on the crossbars (see Figure 2-21 on page 48) to set an equal separation at both crossbar locations.

NOTE

See “Using the Wedge-Separation Indicators” on page 51 for instructions on how to use the wedge-separation indicators.

2.6 Configuring the Scanner without the Setup Template

When the outside diameter of the pipe to be inspected is not available on the setup templates, use the following procedure to configure the COBRA scanner. You will need a pipe or a section of a pipe with the required outside diameter to configure the scanner.

To configure the scanner without the aid of the setup template

1. Unclip the couplant tubes and the probe cables from the cable-management posts.
2. Loosen, by one turn, the self-captured pivot screws of the female links and, if applicable, of the half links and medium links (see Figure 2-19 on page 46).

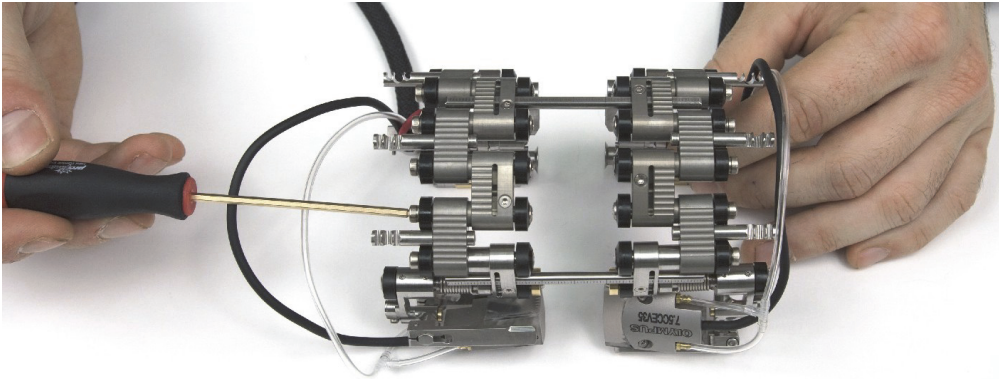


Figure 2-19 Loosening the links

NOTE

If the joints do not rotate freely with the pivot screws loose, you may have to break them loose by hand using a little force.

3. For single-probe scanning, you need to separate the two halves of the scanner (see Figure 2-20 on page 47):
 - a) Loosen the crossbar screws of the encoder side.
 - b) Remove the other side of the scanner with the crossbars.
 - c) If applicable, remove the center crossbar.
-

NOTE

For single-probe scanning, you must use the encoder side of the scanner.

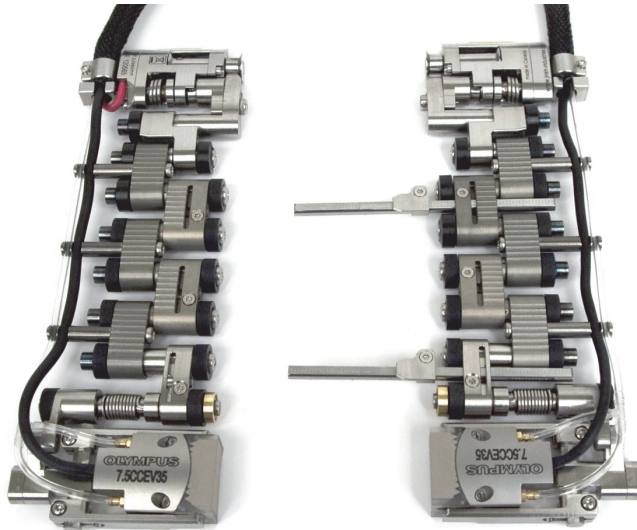


Figure 2-20 Separating the two halves of the scanner

4. For dual-probe scanning, you need to assemble the two halves of the scanner (see Figure 2-21 on page 48):
 - a) For outside diameters less than 32.5 mm (1.280 in.), use only one crossbar. Slide the crossbar through the link of each probe holder, and then clamp the crossbar in the desired position with the crossbar screw.
 - b) For outside diameters greater than 32.5 mm (1.280 in.), use two crossbars:
 - (1) Slide one crossbar through the link of each probe holder, and then clamp the cross bar in the desired position with the crossbar screws.
 - (2) Slide the second crossbar through the male links that are roughly in the center of the scanner, and then clamp the crossbar in place with the crossbar screws.
 - (3) Use the graduations on the crossbars to set the scanner separation equal at both crossbar locations. You can set the exact probe spacing later (see “Using the Wedge-Separation Indicators” on page 51 for details).

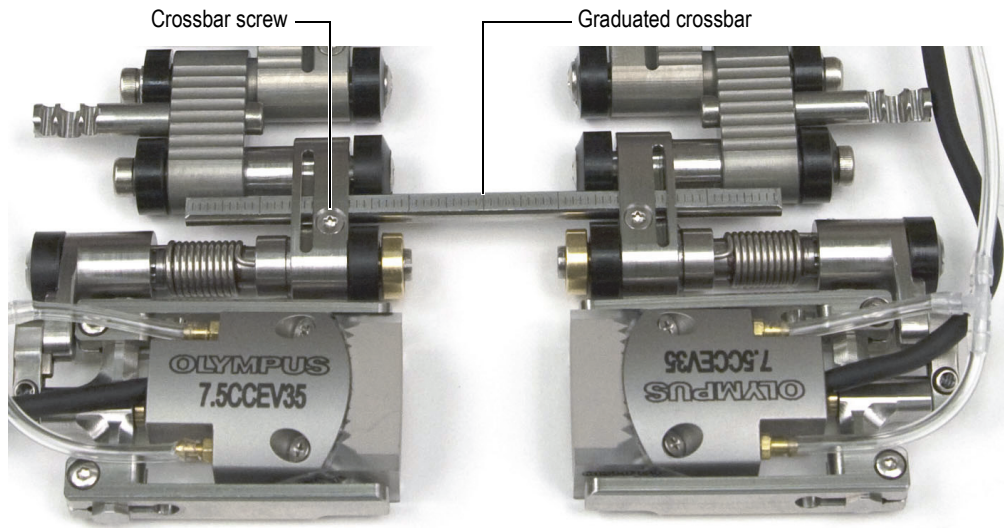


Figure 2-21 The graduated crossbar

5. Determine how to configure the scanner:
 - a) Determine the real outside diameter of the pipe to be inspected. Do not assume that the nominal diameter is the real outside diameter.
 - b) Refer to the scanner setup chart to note the tail setting, the probe-holder position, and the number and type of links required for the outside diameter of the pipe to be inspected (see Table 13 on page 77 for pipe OD smaller than 63.5 mm [2.50 in.] and Table 14 on page 78 for pipe OD larger than 63.5 mm [2.50 in.]).
 - c) See Table 5 on page 67 to select the appropriate wedge for the outside diameter of the pipe to be inspected.
6. As required for your configuration, add or remove links by completely loosening the pivot screws.
7. Adjust the length of the exposed cables and tubes as needed (see “Adjusting the Length of Exposed Cables and Tubes” on page 36 for details).
8. Adjust the tail length as follows:
 - a) Loosen the tail-adjustment screw, and then slide the tail to the appropriate setting.
The tail setting numbers correspond with the notches on the tail (see Figure 2-22 on page 49).

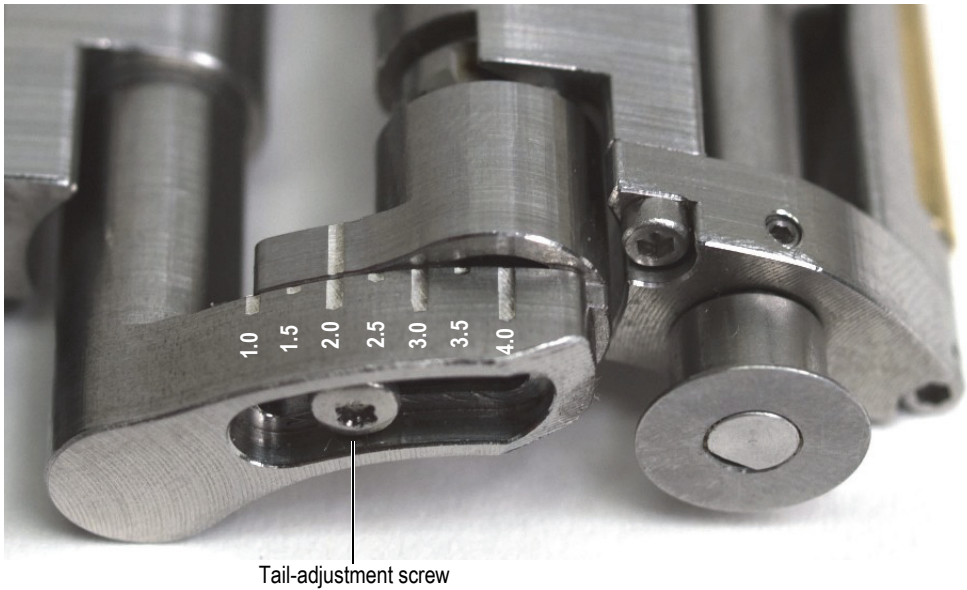


Figure 2-22 Example of tail configured to the 2.0 position

- b)* Retighten the tail-adjustment screw.
9. Configure the probe holder (see Figure 2-23 on page 49):
 - a)* Loosen the probe-holder position screw.
 - b)* Slide the probe holder to the position noted in step 5.*b*, and then retighten the probe-holder position screw.

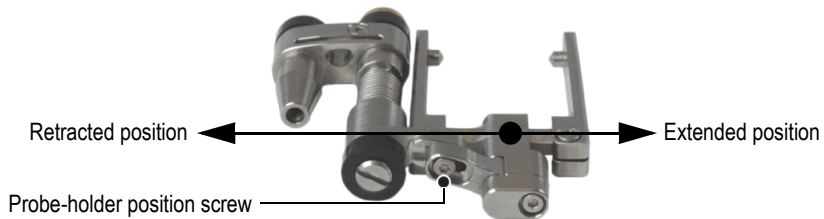


Figure 2-23 The probe holder in the extended position

- c) Install the appropriate wedge and the probe on the probe support (see “Changing the Wedge” on page 35 for details).
10. Adjust the shape of the scanner and the tension of the tail and probe-holder components around the pipe as follows:
- a) Wrap the scanner around the pipe and hold it in place with one hand (see in Figure 2-24 on page 50).



Figure 2-24 Wrapping and holding the scanner

- b) Ensure that all wheels are in contact with the pipe surface.

TIP

To help ensure that the wheels make contact with the pipe surface, lift the probe holder(s) and the tail(s) in such a way that the wedge and the encoder wheel are clear of the inspected surface.

- c) Tighten the pivot screws.
- d) Ensure that the probe supports and tails are touching the pipe surface.
- e) Remove the scanner from the pipe.
- f) Swing the probe holders and the tails slightly inward by hand, overcoming the joint integral friction.
This provides the spring tension required to hold the scanner on the

inspected pipe and to ensure the encoder wheel remains in contact with the inspected surface.

NOTE

The tail and the probe holder are designed with pivoting joints that are not only spring loaded, but also can be quickly repositioned by hand to easily be conformed to the inspected surface curvature.

11. For dual-probe scanning, ensure that the two probe holders are aligned, and that the two tails are aligned.
12. Adjust the length of the exposed cables and tubes (see “Adjusting the Length of Exposed Cables and Tubes” on page 36).
13. Clip the couplant tubes and the probe cables to the cable-management posts.

2.7 Using the Wedge-Separation Indicators

For dual-probe scanning, the wedge-separation indicators, along with the 1 mm graduations on the crossbars, can help you to determine and/or set the distance between the wedge faces.

To use the wedge-separation indicators

1. Set up the COBRA scanner (see “Configuring the Scanner Using the Setup Template” on page 37 or section “Configuring the Scanner without the Setup Template” on page 45).
2. Loosen the crossbar screws on both sides of the scanner.
3. Slide the wedge-separation indicator(s) on the crossbar(s) so that the right-hand side of the wedge-separation indicator(s) is aligned with the required (n^{th}) major graduation from the right-hand end of the crossbar(s) [see Figure 2-25 on page 52].

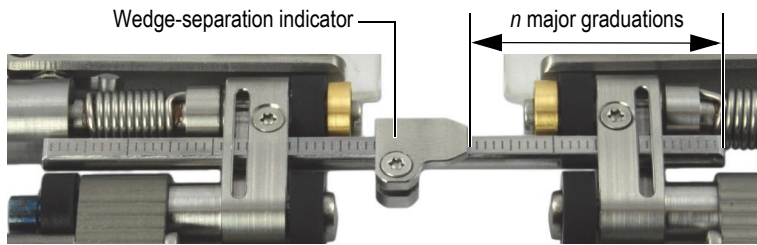


Figure 2-25 Placing the wedge-separation indicator

4. Tighten the wedge-separation indicator screw(s).
5. Slide both sides of the scanner together until the wedge faces touch each other (see Figure 2-26 on page 52).

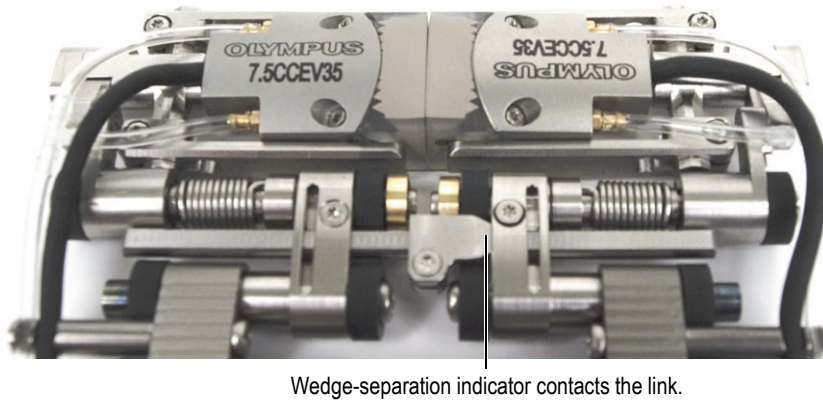


Figure 2-26 Bringing the wedge faces together

6. Slide the crossbar(s) to the right so that the wedge-separation indicator(s) makes contact with the right-hand link (see Figure 2-26 on page 52).
7. Ensure the scanner sides remain parallel.

NOTE

When the scanner configuration uses two crossbars, use the graduations to ensure that the distance between the two scanner sides is the same for both crossbars.

8. Tighten the crossbar screw(s) on the left-hand side of the scanner.
9. Slide the scanner sides apart.
The number of graduations between the wedge-separation indicator(s) and the right-hand side link(s) indicate the distance between the wedge faces in millimeters (see Figure 2-27 on page 53).

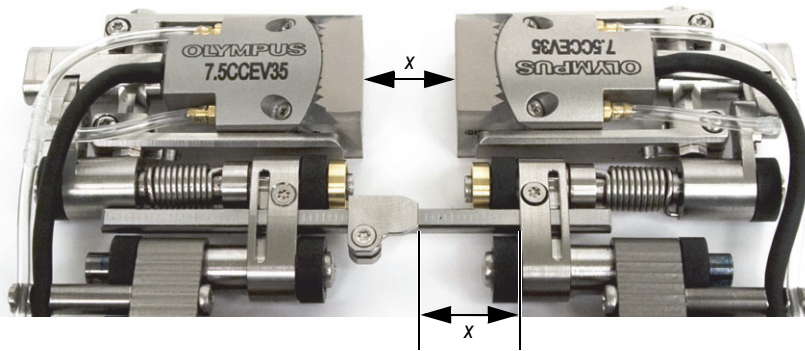


Figure 2-27 Reading the wedge separation

10. When the desired separation is obtained, tighten the right-hand side crossbar screw(s).

NOTE

After the wedge-separation indicators have been set as per the above instructions, to change the wedge separation, only loosen the right-hand side crossbar screw(s).

2.8 Operating the Scanner

When the COBRA scanner is setup for the size of pipe you wish to inspect (see “Configuring the Scanner Using the Setup Template” on page 37 or section “Configuring the Scanner without the Setup Template” on page 45), use the following procedure to operate the scanner.

If you perform the inspection using the OmniScan, refer to the *OmniScan Setup for Weld Inspection Using the COBRA Scanner: Getting Started Guide* for OmniScan configuration details.

To operate the scanner

1. Clip the scanner onto the pipe to be inspected:
 - a) Pull the probes open by hand (see Figure 2-28 on page 54).

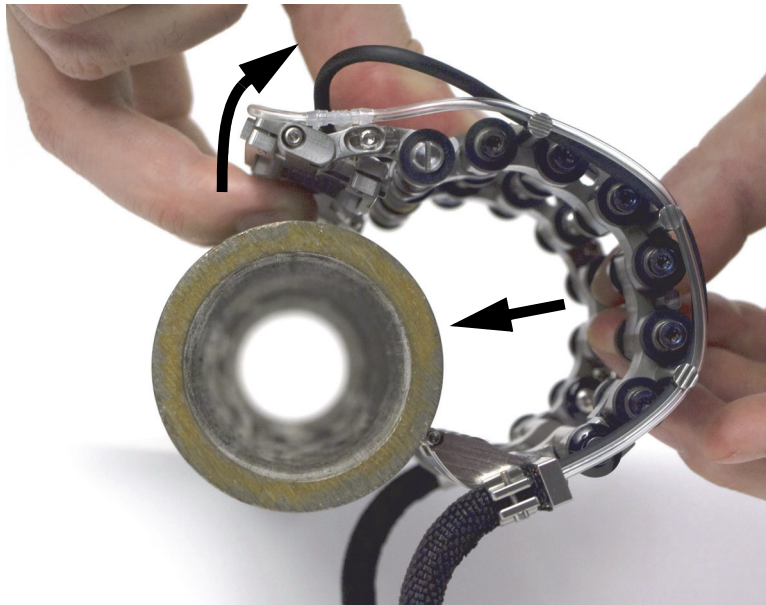


Figure 2-28 Installing the scanner on the pipe

- b) When the probes are engaging the pipe, simply push the scanner onto the pipe.

NOTE

Do not swing the probes open further than required as this could inadvertently reposition the probe holders so that the spring loading required for proper probe-to-pipe contact is lost.

2. Connect the probe and the encoder cables to the acquisition unit.
3. Start and configure your acquisition unit.
4. Connect the main tube to the couplant pump.
5. Open the couplant valve (see Figure 2-29 on page 55).



Figure 2-29 The couplant valve (shown open)

6. Start the pump and adjust the couplant flow.
7. Close the couplant valve to avoid wasting couplant.
8. Rotate the scanner by hand around the pipe to:
 - a) Ensure that the scanner can freely rotate around the complete circumference of the pipe, and that the cable and tube bundle wraps and unwraps without interference from surrounding structures.
 - b) Ensure that the weld is centered between the probes.
 - c) Decide where your inspection should start, and in which direction the scanner should move for the inspection.

NOTE

User experience and preferences dictate the best way to manage the cables, as well as whether the scan is performed in the forward or backward direction.

9. Perform the inspection as follows:
 - a) Open the couplant valve.
 - b) Start the data acquisition on the acquisition unit.
 - c) Manually rotate the scanner around the complete circumference of the pipe (see Figure 2-30 on page 56).
 - d) Close the couplant valve.
 - e) Review the acquired data.



Figure 2-30 Rotating the scanner

10. Remove the scanner from the pipe:

- ◆ If the scanner is configured for two-sided inspection, simply pull on the cross bar.

OR

If the scanner is configured for one-sided inspection, pull on the cable post with one finger and pull the wheels on the other side with another finger to remove the scanner.



CAUTION

To avoid the risk of equipment damage, never pull on the cables themselves.

3. Maintenance and Troubleshooting

3.1 Cleaning the Scanner

Wipe the COBRA scanner clean as required. Do not soak or submerge the scanner in any cleaner or solvent.

3.2 Troubleshooting

Table 3 on page 60 presents troubleshooting cases.

Table 3 Troubleshooting cases

Problem	Possible cause	Solution
The scanner does not properly clip onto the pipe.	Incorrect number of links	Check the setup chart (see “Scanner Setup Charts” on page 76) to find the required number of links for the outside diameter of the pipe you are inspecting. Remember to use the outside-diameter measurement of your pipe. Re-set up the scanner with the correct number of links (see “Configuring the Scanner Using the Setup Template” on page 37 or section “Configuring the Scanner without the Setup Template” on page 45).
	Incorrect tail setting	Check the setup chart (see “Scanner Setup Charts” on page 76) to find the required tail setting for the outside diameter of pipe you are inspecting. Remember to use the outside-diameter measurement of your pipe. Adjust the tail setting as required.
	Tail is not adjusted inward to provide the required spring preload on the pipe surface.	With the scanner removed from the pipe, force the tail(s) inward slightly to provide more preload of the tail on the pipe surface.
	Pivot screws are not tight enough and scanner spreads apart upon installation on pipe.	Repeat the procedure found in section “Configuring the Scanner Using the Setup Template” on page 37 or section “Configuring the Scanner without the Setup Template” on page 45.

Table 3 Troubleshooting cases (continued)

Problem	Possible cause	Solution
Insufficient probe contact	Probe holder not set properly	With the scanner removed from the pipe, force the probe holder inward slightly by hand to provide more preload of the wedge on the inspection surface. Ensure that, on installation of the scanner onto the pipe, the probe holder is not opened further than necessary.

4. Accessories and Spare Parts

The COBRA scanner features numerous parts, components, and accessories. This chapter presents the following sections:

- “Part Order Numbers” on page 64
- “Spare Parts” on page 70

4.1 Part Order Numbers

Table 4 on page 64 provides the part numbers for the COBRA scanner and ancillary equipment. Table 5 on page 67 presents the wedge selection chart to select the wedge that is appropriate for the outside diameter of the pipe to inspected.

Table 4 COBRA scanner and ancillary equipment – part order numbers

Part number	Item number	Description	Package
			COBRA-K-4.5
COBRA	U8750053	Small pipe scanner kit with encoder to cover 21.3 mm to 114.3 mm (0.84 in. to 4.50 in.) pipe outside diameters (OD). Packaged in hard carrying case.	✓
2.25CCEV35-A15C-P-2.5-OM ^a	U8331117	2.25 MHz low profile phased array probe with 16 elements, 0.5 mm pitch, and 10 mm elevation. The elements are curved on the elevation with a 35 mm radius. The cable is 2.5 m long with OmniScan connector.	
3.5CCEV35-A15C-P-2.5-OM ^a	U8331149	3.5 MHz low profile phased array probe with 16 elements, 0.5 mm pitch, and 10 mm elevation. The elements are curved on the elevation with a 35 mm radius. The cable is 2.5 m long with OmniScan connector.	
5CCEV35-A15-P-2.5-OM	U8331163	5 MHz low profile phased array probe with 16 elements, 0.5 mm pitch, and 10 mm elevation. The elements are curved on the elevation with a 35 mm radius. The cable is 2.5 m long with OmniScan connector.	

Table 4 COBRA scanner and ancillary equipment – part order numbers

Part number	Item number	Description	Package
			COBRA-K-4.5
7.5CCEV35-A15-P-2.5-OM	U8330826	7.5 MHz low profile phased array probe with 16 elements, 0.5 mm pitch, and 10 mm elevation. The elements are curved on the elevation with a 35 mm radius. The cable is 2.5 m long with OmniScan connector.	✓ _(x2)
10CCEV35-A15-P-2.5-OM	U8331014	10 MHz low profile phased array probe with 32 elements, 0.3 mm pitch, and 7 mm elevation. The elements are curved on the elevation with a 35 mm radius. The cable is 2.5 m long with OmniScan connector.	
COBRA-A-SA15	U8721205	Two flat shear wave (SW) wedges plus ten pairs of curved shear wave (SW) wedges to cover the 21.3 mm to 114.3 mm (0.84 in. to 4.50 in.) pipe outside-diameter range.	✓
COBRA-A-SA15LW	U8722168	Two flat longitudinal wave (LW) wedges plus ten pairs of curved longitudinal wave (LW) wedges to cover the 21.3 mm to 114.3 mm (0.84 in. to 4.50 in.) pipe outside-diameter range.	
COBRA-A-ST1-70L	U8701348	Two flat wedges plus nine pairs of curved time-of-flight diffraction (TOFD) wedges to cover the 26.7 mm to 114.3 mm (1.05 in. to 4.50 in.) pipe outside-diameter range. Compatible with 3 mm diameter element ST1 UT probes.	
COBRA-SP-IRRIGATION	U8775226	Spare parts kit including irrigation tubes, fittings, and valve (see Table 6 on page 69)	
COBRA-SP-BASIC	U8775166	Basic spare parts kit (see Figure 4-2 on page 69)	

Table 4 COBRA scanner and ancillary equipment – part order numbers

Part number	Item number	Description	Package
			COBRA-K-4.5
COBRA-SP-FULL	U8775188	Basic spare parts kit, plus links and the encoder assembly	
COBRA-SP-SA15	U8750056	One of each of the eleven wedges needed for coverage of 21.3 mm to 114.3 mm (0.84 in. to 4.50 in.) pipe outside-diameter range.	
OMNI-A2-SPLIT128	U8100133	Y-adaptor (splitter) to support two phased array probes on OmniScan MX2 instruments with PA2 128 elements module.	
OMNI-A2-SPLIT64	U8100135	Y-adaptor (splitter) to support two phased array probes on OmniScan MX2 instruments with PA2 64 elements module.	
OMNI-A-ADP05	U8767016	Y-adaptor (splitter) with OmniScan connectors to support two phased array probes	
E128P0-0000-OM	U8800428	Phased array cable extensions required to interface between the Omni-A-ADP05 and an OmniScan MX2 instrument with PA1 128 elements module.	
EIB64-NT-0-P-0-OM	U8779452	Interbox to support 2 phased array probes on OmniScan MX2 instruments with PA1 64 elements module.	
WTR-SPRAYER-4L	U8775153	4 L manual water pump with couplant tubes and fittings	
Omni-A2-ADP20	U8775201	Scanner interface adaptor to connect scanners encoder cables with DE15 connector to OmniScan MX2 with LEMO connector scanner interface.	
Omni-A-ADP27	U8780329	Scanner interface adaptor to connect scanners encoder cables with LEMO connector to OmniScan MX with DE-15 connector scanner interface.	

Table 4 COBRA scanner and ancillary equipment — part order numbers

Part number	Item number	Description	Package
			COBRA-K-4.5
C1-LF-BXM-0.3M	U8769010	0.3 m long adaptor LEMO female to Bendix male linking LEMO encoder cable to FOCUS LT.	
C1-DE15F-BXM-0.30M	U8767107	0.3 m long adaptor DE-15 female to Bendix male linking DE-15 encoder cable to FOCUS LT.	
OmniScan PA or FOCUS LT	—	Many OmniScan and FOCUS LT instrument models can be used. ^{b, c}	

- a. SA15C casings are based on the same design as the A15 but are 2 mm (0.08 in.) taller, increasing height clearance.
- b. Encoder cable adaptor may be required (see Table 10 on page 74).
- c. A two-sided COBRA scanner must be used with a multigroup instrument.

Table 5 Wedge selection chart

Wedge part number	Wedge AOD ^a		Pipe min. OD ^b		Pipe max. OD ^b	
	(in.)	(mm)	(in.)	(mm)	(in.)	(mm)
SA15-N60S-IH-AOD0.84	0.840	21.3	0.800	20.3	0.840	21.3
SA15-N60S-IH-AOD1.05	1.050	26.7	0.840	21.3	1.050	26.7
SA15-N60S-IH-AOD1.315	1.315	33.4	1.050	26.7	1.315	33.4
SA15-N60S-IH-AOD1.66	1.660	42.2	1.315	33.4	1.660	42.2
SA15-N60S-IH-AOD1.9	1.900	48.3	1.660	42.2	1.900	48.3
SA15-N60S-IH-AOD2.375	2.375	60.3	1.900	48.3	2.375	60.3
SA15-N60S-IH-AOD2.875	2.875	73.0	2.375	60.3	2.875	73.0
SA15-N60S-IH-AOD3.5	3.500	88.9	2.875	73.0	3.500	88.9
SA15-N60S-IH-AOD4	4.000	101.6	3.500	88.9	4.000	101.6
SA15-N60S-IH-AOD4.5	4.500	114.3	4.000	101.6	4.500	114.3

- a. Axial outside diameter (AOD)
- b. Outside diameter (OD)

Figure 4-1 on page 68 describes the format of the wedge part number.

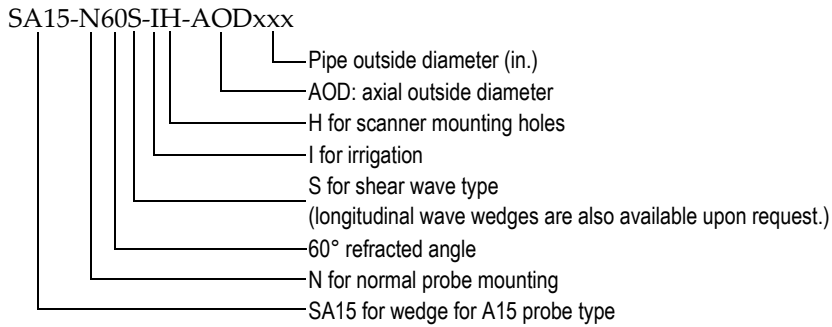


Figure 4-1 The wedge part number

NOTE

Height clearance required for longitudinal wave inspection is 25 mm with SA15 wedges, or 35 mm with ST1 probes and a right-angle cable connector.

Table 6 Fittings and tubing spare part list (P/N: COBRA-SP-IRRIGATION)

Item	Quantity or length	Description
A	0.61 m (2 ft)	Barbed T-splitter for 1/16 in. inside diameter (ID) tube
B	2.44 m (8 ft)	Tubing 1/16 in. ID × 0.09 in. OD
C	0.61 m (2 ft)	Barbed Y-splitter for 1/16 in. ID tube
D	0.61 m (2 ft)	Barbed reducer for 1/16 in. to 3/32 in. ID tube
E	2.44 m (8 ft)	Blue 4 mm OD flexible tube
F	0.305 m (1 ft)	Valve QH-QS-4
G	0.305 m (1 ft)	QS-8-4 push-in reducer
H	Supplied with pump	Blue 8 mm OD flexible tube
I	Supplied with pump	Valve 8 mm HE-2-QS-8

**Figure 4-2 Content of the basic spare part kit (P/N: COBRA-SP-BASIC [U8775166])**

4.2 Spare Parts

An exploded view and a list of spare parts for the COBRA scanner are provided in Figure 4-3 on page 70 and Table 7 on page 70 respectively.

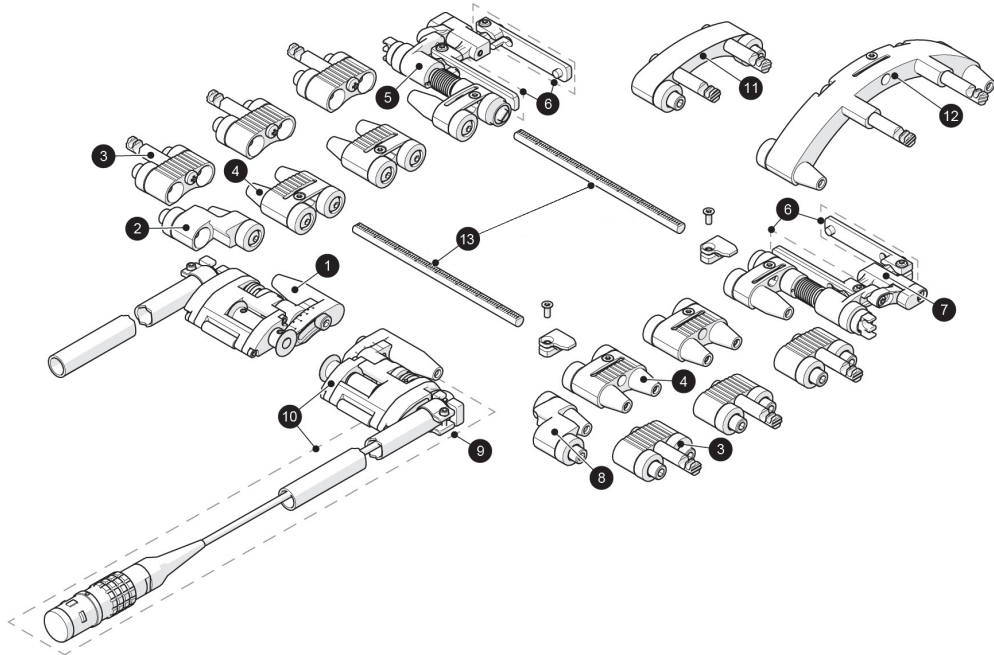


Figure 4-3 Exploded view

Table 7 COBRA scanner part list

Drawing item	Item number	Marketing number	Description
1	U8909466	N/A	Tail link assembly — left (without encoder)
2	U8908870	N/A	Half-link assembly — left
3	U8831689	N/A	Link assembly female

Table 7 COBRA scanner part list (continued)

Drawing item	Item number	Marketing number	Description
4	U8908872	N/A	Link assembly male
5	U8909468	N/A	Probe holder assembly with yoke arms – left
6	U8908979	COBRA-SP-YOKEARM	Pair of yoke arms with screws for one yoke
7	U8909469	N/A	Probe holder assembly with yoke arms – right
8	U8908871	N/A	Half-link assembly – right
9	U8907974	COBRA-SP-ENC	Encoder replacement with 2.5 m cable and LEMO connector compatible with OmniScan MX2 and SX
10	U8909467	COBRA-SP-ENCTAIL	Spring loaded tail assembly (right) with encoder and 2.5 m cable with LEMO connector compatible with OmniScan MX2 and SX
11	Q8300510	N/A	Link assembly (medium) with wire management post
12	Q8300511	N/A	Link assembly (long) with wire management post
13	Q8300011	N/A	COBRA cross bar

5. Specifications

This chapter contains the specifications for the COBRA scanner.

5.1 General and Operating Environment Specifications

Table 8 General specifications

Parameter	Value
Diameter range	21.3 mm to 114.3 mm (0.84 in. to 4.50 in.)
Half scanner width ^a	59 mm (2.32 in.)
Encoder resolution	32.08 pulses/mm (815 pulses/in.)
Voltage	5 V
Current	100 mA maximum
Frequency	0 kHz to 3.5 kHz (maximum displacement velocity of 100 mm/s [4 in./s])

- a. Not including probe cables and couplant tubes

Table 9 Operating environment specifications

Parameter	Value
Operating temperature	5 °C to 50 °C (41 °F to 122 °F)
Storage temperature	-30 °C to 60 °C (-22 °F to 140 °F)
Relative humidity (RH)	Max. 80 % RH, noncondensing
Wet location	Yes
Altitude	Up to 2000 m
Outdoor use	Yes
Pollution level	1
IP rating	Waterproof (designed to meet IP67)

5.2 Connector Reference

COBRA scanners sold after July 2013 come standard with the LEMO connector that is compatible with the OmniScan MX2 and SX instruments. For use with a different instrument, an optional adaptor is required (see Table 10 on page 74).

Table 10 Required encoder cable adaptor

Scanner connector	Instrument			
	OmniScan MX	OmniScan MX2	OmniScan SX	TomoScan FOCUS LT
LEMO (from July 2013 onward)	Omni-A-ADP27	—	—	C1-LF-BXM-0.3M
DE15 (Prior to July 2013)	—	Omni-A2-ADP20	Omni-A2-ADP20	C1-DE15F-BXM-0.30M

Figure 5-1 on page 75 and Table 11 on page 75 contain the pinout for the LEMO connector used on the OmniScan MX2 model.

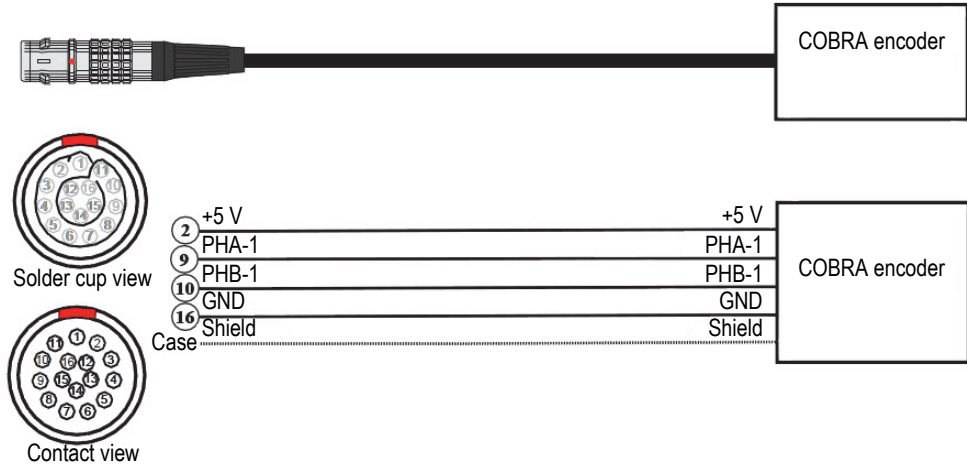


Figure 5-1 LEMO connector pinout diagram

Table 11 OmniScan MX2 pinout for the scanner interface LEMO connector

Pin	Signal	Description
1	N/A	Not used
2	+5 V	External power supply
3	N/A	Not used
4	N/A	Not used
5	N/A	Not used
6	N/A	Not used
7	N/A	Not used
8	N/A	Not used
9	PhA axis 1	Encoder 1: phase A
10	PhB axis 1	Encoder 1: phase B
11	N/A	Not used
12	N/A	Not used

Table 11 OmniScan MX2 pinout for the scanner interface

Pin	Signal	Description
13	N/A	Not used
14	N/A	Not used
15	N/A	Not used
16	GND	Ground
Case	Shield	Ground earthing

5.3 Probe Specifications

Table 12 Standard phased array probe specifications

Parameter	Value
Part number	7.5CCEV35-A15-P-2.5-OM
Frequency	7.5 MHz
Number of elements	16
Pitch	0.5 mm
Elevation	10 mm
Corresponding wedge	SA15
Cable length	2.5 m
Connector type	OmniScan
Elevation curvature radius	35 mm

5.4 Scanner Setup Charts

The scanner setup charts specify how to configure the scanner for a specific pipe outside diameter (see Table 13 on page 77 and Table 14 on page 78).

Table 13 Scanner setup chart for smaller pipes

Pipe outside diameter		Tail setting	Probe-holder position	Number of links per side		
in.	mm			Half	Male	Female
0.84 to 0.86	21.3 to 21.8	1	Retracted			1
0.86 to 0.89	21.8 to 22.6	1.5				
0.89 to 0.91	22.6 to 23.1	2				
0.91 to 0.93	23.1 to 23.6	2.5				
0.93 to 0.95	23.6 to 24.1	3				
0.95 to 0.99	24.1 to 25.1	3.5				
0.99 to 1.05	25.1 to 26.7	4	Centered			
1.05 to 1.10	26.7 to 27.9	1	Extended	1		1
1.10 to 1.15	27.9 to 29.2	2				
1.15 to 1.21	29.2 to 30.7	3				
1.21 to 1.28	30.7 to 32.5	4				
1.28 to 1.36	32.5 to 34.5	1	Extended			1
1.36 to 1.43	34.5 to 36.3	2				
1.43 to 1.49	36.3 to 37.8	3				
1.49 to 1.56	37.8 to 39.6	4				
1.56 to 1.63	39.6 to 41.4	1	Extended	1	1	2
1.63 to 1.70	41.4 to 43.2	2				
1.70 to 1.76	43.2 to 44.7	3				
1.76 to 1.88	44.7 to 47.8	4				
1.88 to 1.96	47.8 to 49.8	1	Extended			2
1.96 to 2.03	49.8 to 51.6	2				
2.03 to 2.09	51.6 to 53.1	3				
2.09 to 2.16	53.1 to 54.9	4				
2.16 to 2.24	54.9 to 56.9	1	Extended	1	2	3
2.24 to 2.30	56.9 to 58.4	2				
2.30 to 2.37	58.4 to 60.2	3				
2.37 to 2.5	60.2 to 63.5	4				

Table 14 Scanner setup chart for larger pipes

Pipe outside diameter		Tail setting	Probe-holder position	Number of links				
in.	mm			Half	Male	Female	Medium	Long
2.50 to 2.60	63.5 to 66.0	1.5	Extended		1		2	
2.60 to 2.70	66.0 to 68.6	2.5						
2.70 to 2.80	68.6 to 71.1	4						
2.80 to 2.86	71.1 to 72.6	1.5	Extended					
2.86 to 2.95	72.6 to 74.9	2.5		1	1		2	
2.95 to 3.12	74.9 to 79.2	4						
3.12 to 3.19	79.2 to 81.0	1.5	Extended					
3.19 to 3.28	81.0 to 83.3	2.5			2	1	2	
3.28 to 3.39	83.3 to 86.1	4						
3.39 to 3.45	86.1 to 87.6	1.5	Extended					
3.45 to 3.55	87.6 to 90.2	2.5		1	2	1	2	
3.55 to 3.67	90.2 to 93.2	4						
3.67 to 3.73	93.2 to 94.7	1.5	Extended					
3.73 to 3.82	94.7 to 97.0	2.5			2		3	
3.82 to 3.94	97.0 to 101.3	4						
3.94 to 3.99	100.1 to 101.3	1.5	Extended					
3.99 to 4.08	101.3 to 103.6	2.5		1		1	1	1
4.08 to 4.19	103.6 to 106.4	4						
4.19 to 4.25	106.4 to 108.0	1.5	Extended					
4.25 to 4.33	108.0 to 110.0	2.5					2	1
4.33 to 4.43	110.0 to 112.5	4						
4.43 to 4.49	112.5 to 114.0	1.5	Extended					
4.49 to 4.58	114.0 to 116.3	2.5		1			2	1
4.58 to 4.67	116.3 to 118.6	4						

List of Figures

Figure i-1	The OmniScan MX2 and the COBRA scanner	21
Figure i-2	Operating the COBRA scanner in a limited access area	22
Figure 1-1	The COBRA scanner	23
Figure 1-2	Scanner component identification	25
Figure 1-3	Link types	26
Figure 1-4	Pipe-to-component interface inspection with the one-sided scanner configuration	26
Figure 1-5	The setup templates	27
Figure 1-6	Tools included with the COBRA scanner	29
Figure 2-1	Removing the sleeve clamp	32
Figure 2-2	Installing the protective sleeve	33
Figure 2-3	Installing the sleeve clamp	33
Figure 2-4	Installing the probe and the wedge on the scanner	34
Figure 2-5	Changing the wedge on the scanner	35
Figure 2-6	Clipping the tube and the cable on the post	37
Figure 2-7	The tail-adjustment screw	38
Figure 2-8	Insert the tail in its setup template pocket	39
Figure 2-9	Tightening the tail-adjustment screw	39
Figure 2-10	Rotating the tail to the initial position	40
Figure 2-11	Installing the half-link	41
Figure 2-12	Adjusting the probe-holder position	41
Figure 2-13	Installing the probe holder into the setup template	42
Figure 2-14	Installing male links	42
Figure 2-15	Installing female and/or medium links	43
Figure 2-16	Rotating the probe holder to set the position for OD larger than 33.4 mm (1.315 in.)	43
Figure 2-17	Rotating the probe holder to set position for OD smaller than 33.4 mm (1.315 in.)	44
Figure 2-18	Rotating the tail to set position for a small pipe setup	44
Figure 2-19	Loosening the links	46

Figure 2-20	Separating the two halves of the scanner	47
Figure 2-21	The graduated crossbar	48
Figure 2-22	Example of tail configured to the 2.0 position	49
Figure 2-23	The probe holder in the extended position	49
Figure 2-24	Wrapping and holding the scanner	50
Figure 2-25	Placing the wedge-separation indicator	52
Figure 2-26	Bringing the wedge faces together	52
Figure 2-27	Reading the wedge separation	53
Figure 2-28	Installing the scanner on the pipe	54
Figure 2-29	The couplant valve (shown open)	55
Figure 2-30	Rotating the scanner	56
Figure 4-1	The wedge part number	68
Figure 4-2	Content of the basic spare part kit (P/N: COBRA-SP-BASIC [U8775166])	69
Figure 4-3	Exploded view	70
Figure 5-1	LEMO connector pinout diagram	75

List of Tables

Table 1	Standard tube and pipe ODs supported by the setup templates	28
Table 2	Required tools (included with the scanner)	29
Table 3	Troubleshooting cases	60
Table 4	COBRA scanner and ancillary equipment – part order numbers	64
Table 5	Wedge selection chart	67
Table 6	Fittings and tubing spare part list (P/N: COBRA-SP-IRRIGATION)	69
Table 7	COBRA scanner part list	70
Table 8	General specifications	73
Table 9	Operating environment specifications	74
Table 10	Required encoder cable adaptor	74
Table 11	OmniScan MX2 pinout for the scanner interface LEMO connector	75
Table 12	Standard phased array probe specifications	76
Table 13	Scanner setup chart for smaller pipes	77
Table 14	Scanner setup chart for larger pipes	78

