



Box Tunnel Read Station

User's Manual

Revision 02

CKP P/N 10071147

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Box Tunnel Read Station User's Manual

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1 Revision Control

1.1 Revision History

Content changes to this document from its previous version to the current level are indicated by Microsoft Word track changes bars (|) in the left margin of the document unless a complete rewrite is indicated. Accept all tracked changes to the current document before updating it. This procedure highlights the new changes made to the document by the author thus facilitating efficient review of the document.

Revision #	Revision Date	Change Description and Explanation	Created/Changed By
00	20.01.2016	CR2633K	Heiko Doering
01	20.06.2016	CR2633N	Heiko Doering
02	12.10.2016	CR2633P	Heiko Doering

2 Safety information

2.1 Basic Safety Information

- All trained Field Service Technicians, installers and operators must read this document before using the Box Tunnel Read Station for the first time. This document explains the intended mode of operation. Please keep this document for later reference.
- The Box Tunnel Read Station is used for contact less reading of RFID (Radio Frequency Identification) Tags. Use only in the manner described.
- Never use the Box Tunnel Read Station in areas where there is a danger of explosion.
- Follow all safety warnings (see Page 6 below) on the equipment. Depending on your role and responsibility for installation, maintenance or normal use of the product, please acknowledge the safety precautions described in the Installation Manual (CKP P/N 10085388) and/or your local Maintenance Manual(s).



- All safety notices in this manual are identified with a Caution symbol shown at left. Caution indicates the possibility of system equipment failure, whereas a Warning symbol (below left) indicates **danger of bodily harm** or other serious injury or even death.



- It is essential to comply with the electrical, mechanical and environmental specifications given in the Technical Data section.
- Users (Operators) are NOT permitted to make any changes or modifications to the hardware, electronics or wiring. Checkpoint-certified technicians are permitted to make electrical changes to non-radio circuitry (e.g., custom wiring for site integration).
- Users are not permitted to make any mechanical modifications, and it will void all guarantee claims if changes are made.
- Dispose of the Box Tunnel Read Station properly after taking out of service. Never put this product into the normal household waste.



2.2 Cautions For Doors and Powered Devices

The Box Tunnel doors are removable, but this should not be done unless necessary. Never bypass the switches.



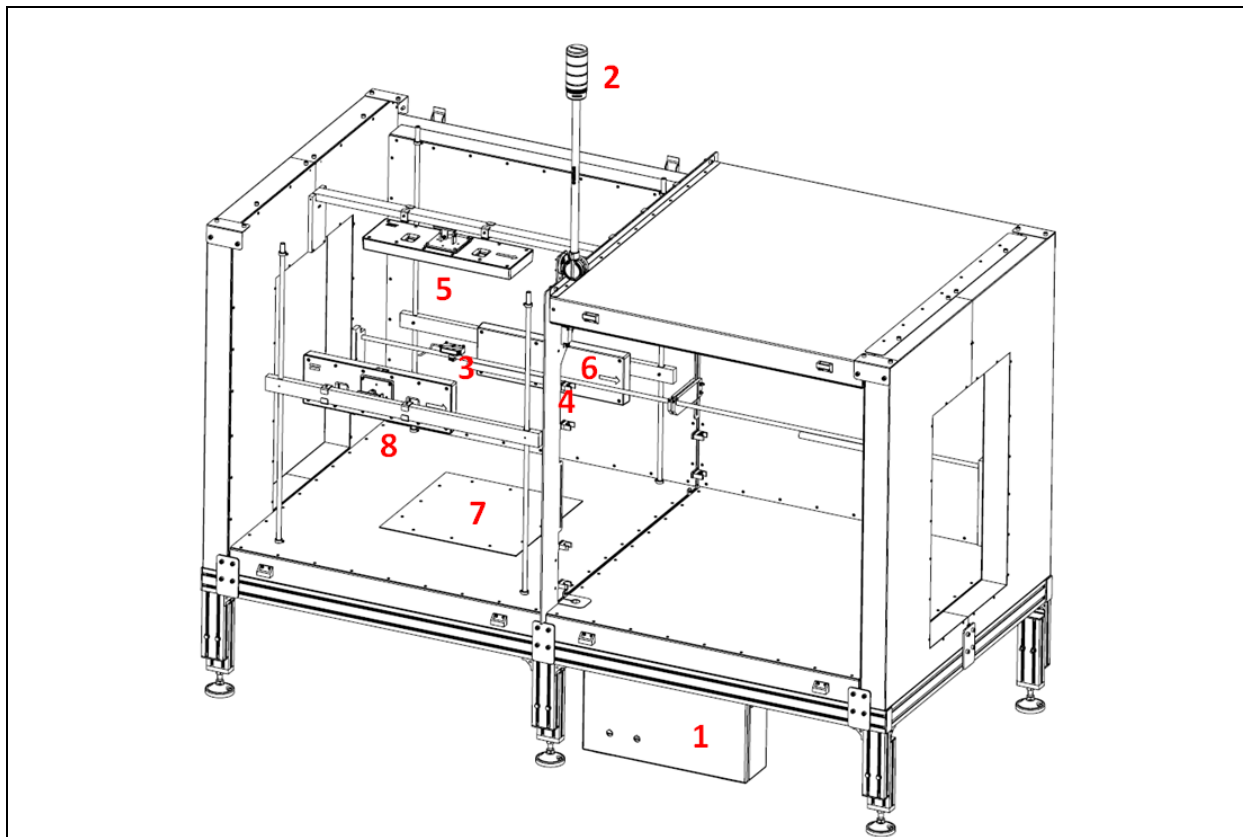
Warning: *The safety precautions described below must be observed at all times.*

Please observe the Pinch Point and Live Voltage warnings on the system (see table below).

Sign	Safety Precaution
 <p>Vor Öffnen des Gerätes Netzstecker ziehen. Before opening disconnect mains. Avant d'ouvrir l'appareil retirez la fichemâle. Antes de abrir el aparato sacar el enchufe.</p>	<p>Control Box is under Live Voltage</p> <p>Before opening the Control Box disconnect mains; to service the electronics, fully remove the electrical plug from the AC Mains socket.</p> <p>Even when the Mains Control Switch is in the OFF position or the fuse F1 is off, parts of the device can be under live voltage.</p>
	<p>"Pinch Point"</p> <p>Keep hands/fingers <u>clear of openings</u> and when applying or removing the enclosure doors.</p> <p>Where these labels are applied, there is a potential for squeezing or physical harm.</p> <p>At the entrance and exit opening of the tunnel, there is a high risk to get squeezed between a box on the conveyor and the housing entrance.</p> <p>Never put a hand or other body parts inside the openings of the tunnel, except to service. When servicing the device(s), the system must be turned off completely as described above.</p>

3 Introduction

3.1 System Design 3D View



Box 500 enclosure with parts hidden to reveal components inside the tunnel enclosure.

#	Component Name
1	Control Box
2	Light Stack
3	RFID Start Sensor / Beam Switch control signal
4	RFID Stop Sensor
5	Antenna 1 (Top)
6	Antenna 4 (Left)
7	Antenna 3 (Bottom, fixed pattern antenna)
8	Antenna 2 (Right)

3.2 Versions Overview

CKP P/N	Omnify Description	Region	Detailed description
10093429	*BOX TUNNEL READ 500 ETSI	ETSI	RFID Read tunnel, sometimes called "Assignment Station V2." This size tunnel supports boxes (shipping containers) up to 600mm in height and conveyor widths up to 500mm. The physical enclosure has an entrance/exit opening that is 650mm in height. See table below for English measure conversions from metric standard (SI).
10040615	*BOX TUNNEL READ 800 ETSI	ETSI	Tunnel for 800mm conveyor width, 500mm box height, 550mm opening height.
10054589	*BOX TUNNEL READ 500 FCC	FCC	FCC region performance; Tunnel for 500mm conveyor width, 600mm box height, 650mm opening height.
10073543	*BOX TUNNEL READ 800 FCC	FCC	FCC region performance; Tunnel for 800mm conveyor width, 500mm box height, 550mm opening height.

Metric (SI)	*English, Imperial Units
400mm	15.75in
500mm	19.69in
550mm	21.65in
600mm	23.62in
650mm	25.59in
800mm	31.50in

*Rounded to the nearest 1/100th of an inch.

3.3 Installation Requirements

Installation must be done by a Checkpoint Field Service technician trained for the installation of this hardware.

Between 1 and 4 Ethernet/LAN Ports must be provided by the customer near the house installation position. The customer LAN port(s) should be no more than 5m away from the control box. Refer to Section 4.2 [Electrical Data](#) for AC mains requirements.

If there is a need to replace or add cables into the control box, refer to Section 5.4 [Cable Entry Module Handling Instruction](#) for the description of the SKINTOP CUBE cable entry module.

3.4 Box Tunnel Read Station Hardware Overview

The Box Tunnel Read Station is a large enclosure with main components listed below:

- UHF RFID Reader (WRTZ-1500 with housing)
- fixed beam antenna
- beam switch antennas
- “Standard” Light Barrier (Beam Break) Sensors

There are several other important components such as the I/O Board for DC Applications, and secondary Sensors and a Barcode Scanning device, and their host electronics, involved with the solution. The following components are also standard:

- Control box
- Light stack
- (4) Lever action Switches to detect open doors
- Shielding chambers (i.e. the walls)

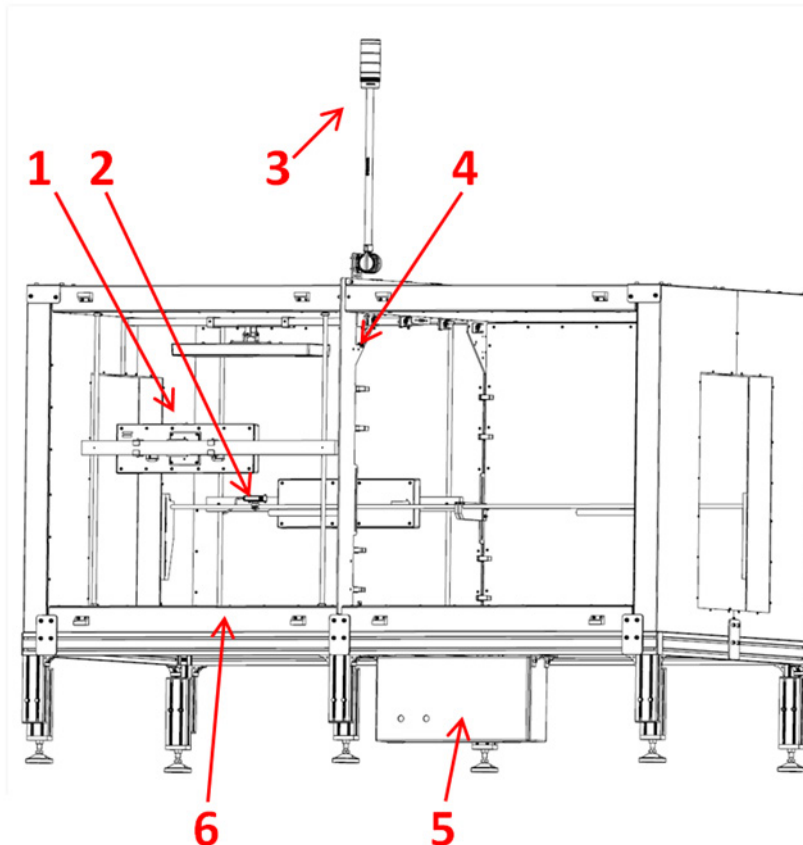
3.4.1 Main Hardware

All antennas and electronics are mounted inside shielding to reduce RF spill to other stations. There is no need to disassemble the conveyor at the installation. The enclosure is designed to be built up around the conveyor.

Detection of the RFID tags/labels and the process for starting and stopping the RFID Reader’s inventory (EPC read) are discussed later on this document.

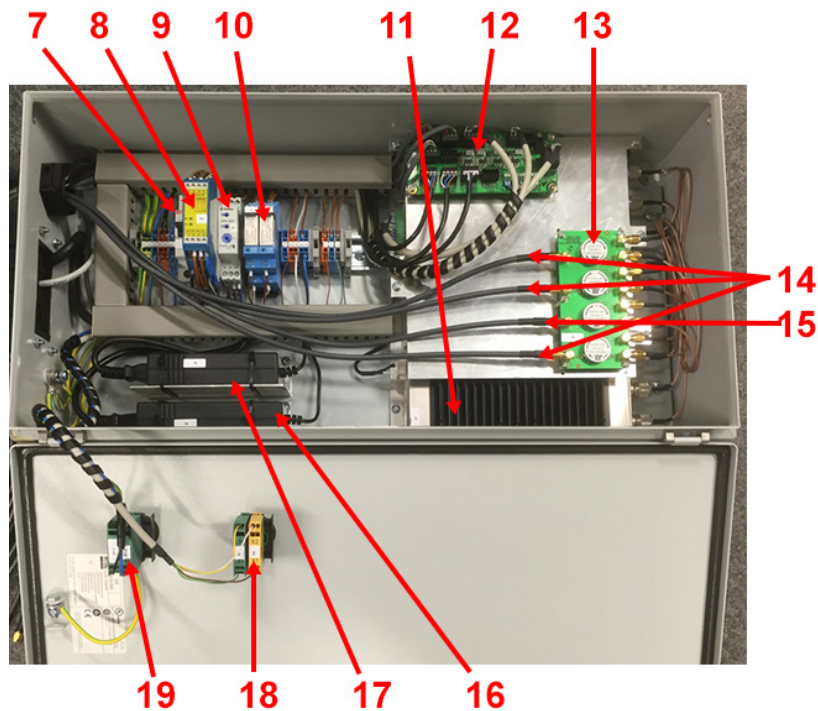
Users do not typically have access to the control box electronics (5).

If advanced user maintenance or troubleshooting is expected, additional documentation will be provided.



Note: Box 500 with two doors opened to show the internal components.

#	Name and Manufacturer
1	Antenna, Beam switch, Checkpoint (P/N varies by region)
2	Beam Sensors (2 inside enclosure), Leuze HRT-46B/66-S12
3	Light Stack, Werma 69750055
4	Door switches, Honeywell 9432580
5	Control Box, assembled by Checkpoint or an external manufacturer
6	Antenna, Kathrein (P/N varies by region)



#	Name and Manufacturer
7	Fuse, D4A, Schneider C60HD104 - 25698
8	Safety Relays, Zander Aachen SR3C
9	Time Relays, Finder 82.01.0.240.0000
10	Relays, Finder 38.62.0.024.0060
11	RFID Reader, WRTZ-1500, Checkpoint 10034075
12	PCB, I/O Board for DC Applications, Checkpoint 10089472
13	PCB, RF Circulator board, Checkpoint 10056858
14	Cable, Antenna Coax, 4,7m, for Beam switch Antenna, Checkpoint 9432018
15	Cable, Antenna Coax, 2,5m, for Kathrein Antenna
16	PSU, 12V DC for Reader, XP Power, 7421850
17	PSU, 24V DC, (P/N and Manufacturer will vary by region)
18	Startup Button
19	AC Mains Control Switch (power switch)

Discuss your requirements for spare parts with your Local Checkpoint Representative. Parts may be pre-ordered to have on site as spares.

3.4.2 Light Stack (Signal Tower)

The light stack has three colors as indicators for the current status of the system.



Signal	Continuous on (or flashing)	Off
Red	Error/ Conveyor stopped	Normal operating mode
Amber	Reader's RF transmit is on; several other optional meanings	RF off
Green	System Health Status OK	Possibly no power/ wiring or relay issue
All on	All LEDs are illuminated during startup	
All off	Power is off	

Note: LED states are configurable.

Combinations of the colors are expected (e.g. red and green LEDs both on at the same time). For your unique application, Checkpoint FS/Engineering will provide documents that indicate what each color means for your use case/control wiring.

3.5 Start Up Sequence

To start using the Box Station, the Operator must turn the Mains Control Switch to the ON position. Immediately after, the 24V PSU and the safety relay (B4) are powered. There is a Push Button Startup switch on the front of the Control Box. The start button will be green (LED is illuminated), and this indicates that the system is ready to be turned ON. The Operator must press the switch to initiate the start up.

Immediately after, the RFID Reader and additional relay components in the circuit are powered. After approximately one minute (60 seconds), the system will be operation (RFID Reader is booted up and the Light Stack changes color to Green or goes off, depending on the configuration).

As an Optional feature, the system can be programmed to send a "Ready" signal to the conveyor PLC to start the conveyor.

To turn Power OFF:

Turn the Mains Control Switch to the OFF position.

3.6 Normal Operation

The Box Station will detect EPCs which are previously encoded to the RFID tags/labels which pass through it in lots (sometimes called “Bundles”). The “EPC-LOT” streaming data is processed by an external system, either a Server (OAT Edge Box) or even cloud services. The system can only accurately distinguish the EPC belonging to one shipping container from another if it is properly tuned and there is adequate distance between boxes. The **minimum distance** between boxes is a function of the speed of the conveyor. Refer to the Marketing Sell Sheets and/or Installation Manual for more details.

3.6.1 RFID Start Sensor

The start sensor is positioned nearer to the tunnel entrance than the stop sensor. The sensor’s rising edge signal is triggered by the leading edge of the box. The sensor’s secondary signal is also triggered, and remains held in a low state while the box is present. The Beam Switch function is driven without interaction with the RFID Reader. When the antennas are “switched” this means the sensor detects a container/box in front of it. The RFID Start Signal (Sensor 1 input) is routed to GPI2, and the reader turns on Inventory when the signal arrives.

3.6.2 RFID Stop Sensor

The stop sensor only uses the primary output (only 1 connector attached to this cable, while the start sensor has 2 connectors from it, accordingly). Its role is to tell the RFID Reader to stop Inventory. The container/box in motion passes the sensor, which causes the falling edge signal, which is what the I/O Board and RFID Reader are programmed to look for. When the box passes, RFID reads stop.

3.6.3 Fixed Antenna

The RFID UHF Pattern is directional, with the polar pattern aimed toward the tunnel exit. This antenna only transmits, like the others, between events of RFID Start and RFID Stop trigger signals.

3.6.4 External Interfaces

The RFID Reader’s ETHERNET port will typically be connected to a LAN port for customer network access (or else an “unmanaged switch”) where a local network can be set up for the devices involved with the total solution to exchange communications. There is a standard TCP/IP port reserved for incoming messages (OFS signaling to Wirama). PuTTY can be used to see the outbound (EPC-LOT) streaming data or to check integrity of the incoming messages.

There is also a cable reserved for hard-wired signaling to an external conveyor relay for emergency Stop/Start of the conveyor based on reader events (see X3 Interface section below).

3.6.5 Relay Functions

S1 is the Mains Control Switch (Power ON/OFF). S2 is the Start button with LED.

S3 to S6 are the Door switches. They are in series with the Safety Relay which can power down the 12V Power Supply, causing the RFID Reader to shut off; meanwhile, the relay triggers the appropriate Light Stack LED to indicate processing has halted.

When S1 is ON, the 24V PSU and the Safety Relay B4 are powered.

After momentary actuation of the Start button (S2 Switch) the reader PSU gets power and K3 receives power.

When time relay K3 starts, K3-15/18 contacts are opened for one minute (60 seconds) . During this time the reader boot up and set its outputs in a defined condition. The K3-15/18 will close after the defined time (one minute).

The output to the PLC (Programmable logic controller) is then controlled by the reader. This is the normal operating mode.

3.6.5.1 Input/Outputs and Door Switch shutdown

When GPO4 of the reader changes its state to turn on the red light from the signal tower, the relay K2 will open the contacts K2-21/22. With (optional) wiring, the open contact (normally closed circuit, now open) is the signal to the conveyor PLC telling it to stop the conveyor.

When a network failure appears the reader will change the state of all Outputs. All 3 indicators from the signal tower off and K1-21/22- open the switch contact to the conveyor PLC-information to stop the conveyor.

Opening a door will activate the safety relay B4.

The contact B4-13/14 will open and the reader PSU gets switched off.

The contact B4-23/24 will open and give a stop signal the conveyor PLC.

The contact B4-41/42 will close and P1 illuminate the Start switch S2 then.

The safety relay will remain in this state until all doors are closed again and the Start button gets actuated to reset the safety relay.

3.6.5.2 X3 Interface function:

The interface X3 is a preassembled connector. Available from pins 3 and 1, the normally closed circuit indicates normal operation. If a network failure, one of the 4 doors gets opened or a power failure appears the contact between these pins gets an open state.

4 Technical Data

4.1 Mechanical Data

System Version	Length/ mm	Width/ mm	Height/mm*	Weight/kg packed
Box 500 versions	2500	1350	1740- 1950 mm	350
Box 800 versions	2500	1600	1740- 1950 mm	400

Note: *height excludes the light stack (add 770mm for height to top of standard light stack).

4.2 Electrical Data

Input Voltage: 100-240 V~; 50/60 Hz; 0,5-0,25A, internal Fuse D4A

At the house installation position must be a mains socket with a fuse of C10A or higher. A second AC outlet may be required for power connection of (optional) peripheral devices.

4.3 Environment Specification

Operating Temperature 5-45 °C

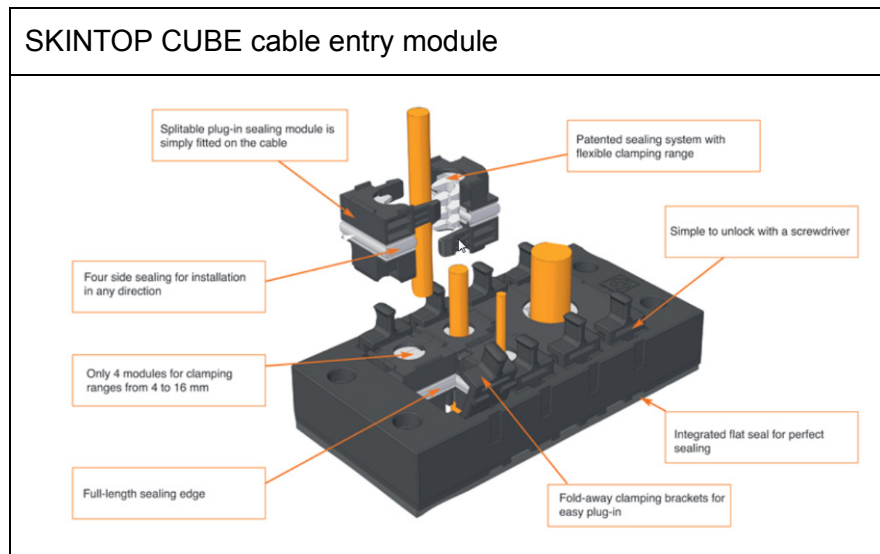
Storage Temperature -20 to 65°C

Relative Humidity 5% to 95% non-condensing

4.4 Schematics and Diagrams

The Box Tunnel circuit diagram and wiring diagram of the control box/system components will be distributed to the responsible Technicians at your site.

4.5 Cable Entry Module Handling Instruction



Removing a sealing module:

1. lift the clamping bracket with a screw driver
2. fold away the clamping brackets
3. remove the sealing module out of the opened clamping brackets

Prepare and inserting of a new cable:

1. select the sealing module according the cable diameter
2. fit the sealing module parts to the cable
3. insert the sealing module into the frame
4. lock the clamping bracket



Caution: After all changes to the SKINTOP CUBE module ensure that all cables and sealing modules are properly inserted into the frame. All clamping brackets must be closed.

4.6 Declaration of Conformity

DECLARATION OF CONFORMITY

Directive 99/5/EC (R&TTED)

Manufacturer or

Authorized representative: **Checkpoint Systems International GmbH**

Address:

**Brentanostraße 27 – 29
69434 Hirschhorn, Germany**

We declare on our sole responsibility, that the following product:

Kind of equipment: **RFID READER System**
Type-designation: **Box Ass.600(Conv,500-Tunn.650)**
Box Ass.400(Conv,800-Tunn.550)

is in compliance with the essential requirements of §3 of the R&TTED.

- Health and safety requirements pursuant to §3(1)a:

Applied Standard(s) or other means of providing conformity:

EN 60950-1 : **2006 + A2:2013**
EN 50364 : **2010**
EN 62369-1 : **2009**
EN 60204-1 : **2006+ A1:2009**

- Protection requirements concerning EMC §3(1)b:

Applied Standard(s) or other means of providing conformity:

EN 301 489-1 V1.9.2 : **2011**
EN 301 489-3 V1.6.1 : **2013**

- Measures for the efficient use of the radio frequency spectrum §3(2)

Applied Standard(s) or other means of providing conformity:

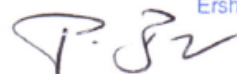
EN 302 208-2 V2.1.1 : **02/2015**
EN 302 208-1 V2.1.1 : **02/2015**



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