



SCS
Forest Products Inc.

**KILNSCOUT® MC PRO 2020
Installation Guide**

Doc #: SCS.005.112.142
Rev #: 07.13.16



INSTALLATION GUIDE

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This guide applies to the following software versions: v1.xx.xx.xx

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INTRODUCTION

KilnScout® is a wireless moisture measurement system designed to monitor the drying process of lumber in a kiln. The moisture content can be transmitted to a kiln controller for real-time control. Monitoring with KilnScout® can increase throughput and improve yield.

The installation of the KilnScout® occurs in six phases:

- Phase I - Project Plan
- Phase II – Conduit / Wire installation
- Phase III - Terminations
- Phase IV – Networking
- Phase V - Commissioning
- Phase V – Post-commission

This document describes each phase of the installation process.



PHASE I – Project Plan

Scope

Key players are identified, system architecture is determined, enclosure locations are decided, conduit runs are established, and project scheduling is finalized.

Key Information

Contacts

- Customer
 - Project Manager
 - Kiln Supervisor
 - Maintenance Supervisor
 - IT Network Specialist
- Electrical Vendor
 - Project Manager
 - On-site Supervisor
- Kiln Controller Vendor
 - Project Manager
 - On-site Supervisor

Site Specific information

- Shipping address
- Plan view of kilns, MCC, and control rooms
- Location of kilns to integrate with KilnScout®
- Kiln type, i.e. batch or continuous.
- Species, mixture and board lengths.
- Number of measurement points for each kiln.
- Kiln controller type to integrate with KilnScout®. To determine if your specific hardware is compatible, contact a representative at SCS Forest Products.
- Location of kiln controller interface port
- Length of wire required
- Dimension of lumber packages to determine dimension of metal plates for measurement points (see Appendix B).

Layout of KilnScout® System

- Location of Hub Box(s).
- Layout of conduit between PC and Hub Box(s).
- Conduit between PC and kiln controller interface.



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Dimensions of Metal Plates – Requirements (see Appendix B)

- Each plate must have an area of between 668-695in² (4310-4484cm²).
- The plate length should be equal to the width of the package.
- Consider the distance between stickers which can limit plate width.
- Ideally, the plates should be inserted into the lumber package after the charge has been pushed into the kiln. However, if there isn't enough room inside the kiln to insert plates into the packages, then plates can be put in outside of the kiln.(note: the plates bend and can also slide in at a slight angle)

Schedule

- Schedule showing ship dates, time required by electrical vendor (including time required inside each kiln), terminations, and commissioning



PHASE II – Conduit/Wire Installation

Scope

All hardware provided by SCS and the electrical vendor is shipped to the customer's site, enclosures are mounted, conduit is hung, and all required wire/cables are pulled.

Materials

SCS Provided Materials

- Computer(s).
- Hub Box(s).
- Antenna Array and Ground Plate(s).
- KilnScout®(s).

Electrical Vendor Provided Materials

- Conduit & Fittings.
- An RS-485 compliant, twisted shielded two pair cable (e.g. Belden 82842, 7201A, 3107A, etc.).
- Supply voltage conductors.

Conduit External to Kiln

Conduit external to the kiln is intended to provide mechanical and rodent protection. The following requirements must be followed:

1. Installations must conform to all electrical ordinances (local, state, and federal) including, if required, obtaining a permit.
2. Conduit must completely encase all cables/wires.
3. Conduit may be installed with threaded or slip fit connectors.
4. Conduit must be sized for the number of cables pulled.
5. At the kiln penetration point, conduit exterior to the kiln should have weep holes that drain any water escaping the RTV (or Duct Seal) packed in the conduit.
6. Conduit should be sloped towards a designed low point where a Tee is installed for drainage.
7. Conduit should be located in areas unlikely to be damaged by forklifts or other site specific equipment.
8. All locations where cables exit the conduit should be de-burred; if necessary, bushings should be installed.
9. Conduit should be sloped to a low drainage point to accommodate condensate forming inside the conduit.



Hub Box and Antenna Array

The Hub Box is a wireless receiver that stores all transmissions from KilnScout® devices inside the kiln and is mounted external to the kiln. An 18" coaxial cable connects the hub to an antenna array mounted inside the kiln.

Requirements include:

1. Locate hub enclosure on the outside of the kiln.
2. Conduit should be sloped to a low drainage point to accommodate condensate forming inside the conduit and/or box. Recommend using a breathing gland to reduce condensate, e.g. Stahl 8162.
3. Antenna should be mounted on a central point inside the kiln to maximize reception from all KilnScout® devices inside and be on the opposite side of the hub box on the exterior of the kiln.
4. Enclosure should be mounted to a wall that provides easy access to the installer and maintenance personnel.
5. Remove all installation related debris (e.g. metal shavings, wire insulation, etc.) from the enclosure.
6. Antenna array grounding plate is designed to clamp to the provided antenna arm.
7. Antenna ground plate should be located 4.25" from centerline of antenna.
8. High temperature antenna screwed into antenna array bulkhead fitting.
9. Antenna should point downward to aid water drainage.

Figure #1 - Hub Box



Figure #2 – Antenna Array





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Figure #3 - Hub Box with preventative drainage





Cable & Wire

RS-485 Hub Network

1. PC and hubs are daisy chained together on the network.

Hub Supply Voltage

1. 24V Power supply provided but will need 120 VAC.

Control Network to Computer

1. PLC network cable is pulled between PLC interface point and PC (Note: Each integration project is unique. SCS Forest Products provides necessary software drivers to communicate with the PLC. However, additional hardware and/or software may be required and would be provided at an added cost).

Business Network to Computer (optional for Remote Access)

1. The customer should provide Internet access to the KilnScout computer to allow SCSFP to provide remote support. This can be established using a method that best suits the customers' requirements. We do, however, recommend TeamViewer.



PHASE III - Terminations

Scope

All wires and cables are terminated in the kiln and enclosures.

Tools

- #2 Phillips screwdriver
- ¼" screwdriver
- 1/8" screwdriver
- Wire strippers
- Multi-Meter

Hub Box

Terminations

1. Terminate a RS-485 pair to the hub's A+, B- and ground. Daisy chain each hubs' communications terminal blocks together. Ensure the PC is connected to the RS-485 network.
2. Terminate 24VDC as labeled on hub card terminals .

Jumper Positions

1. RS-485 communications selected
2. RS-485 terminal jumper selected if hub is the last device on the network.

Figure #3- Hub Wiring



PHASE IV – Networking

PC Setup

1. Install computer in final location.
2. Put computer on network.
3. Confirm PC can be seen on network.
4. Setup remote access.
5. Confirm Kepware license installed.
6. Setup Kepware tags.
7. Register hubs, clear flags, and set date/time.
8. Register devices, assign alias name and mark on device.
9. Link device(s) to Kepware tags.

PHASE V – Commissioning

Power Up

1. Verify power to Hubs.
2. Verify the Kilnscout® (s) has a battery installed and is turned on.
 - i. **Battery Installation/Power**
 1. Remove Phillips head screws. Caution: do not lose the 2 screw O-rings and the cover O-ring.
 2. Insert the battery connector into the board. Snap the battery into the clip.
 3. Replace battery cover, making sure to include the 3 O-rings.
 4. Once this is complete, press the “power” button and hold for 3 seconds. Power light will blink 3 times to confirm.



5. Clear flags on each device



6. Verify device data using VLDs inside the kiln(s).
7. Setup watchdog timer.
8. Confirm kiln drying cycle appears normal.
9. Note location of each device on a map.
10. Definition of the KilnScout Status codes:
 - Status of the device. 0 for normal, non-zero for all others.
 - Results are bitwise OR operation.
 - bit 0 = Invalid calibration
 - bit 1 = Low battery
 - bit 2 = Low temperature alarm
 - bit 3 = High temperature alarm
 - bit 4 = High-High temperature alarm

PHASE VI – Post Commissioning

Background

The KilnScout® functions as a capacitance metering instrument. The capacitance levels measured by the KilnScout® are then converted to a moisture number using a “moisture model”, which defines the correlation between the capacitance readings and moisture readings.

The KilnScout® comes preloaded with a default moisture model. As such, the KilnScout® will provide moisture readings in a highly consistent and repeatable manner from the first day of installation. However, due to variations in kiln conditions, species, etc., the readings may require some adjustment in order to match other moisture instruments (such as a hand-held meter or a planer mill meter).

SCS implements a 4 week adjustment protocol after installing KilnScout®.

Data Collection

In order to get the most out of KilnScout®, a dedicated effort to collect data is useful in the first 4 weeks following installation.

The primary data that should be collected is any feedback on the moisture content of specific kiln charges. Even more useful is moisture content data from the planer mill meter - if it is possible to tie that data to a specific kiln charge.



For the first 4 weeks after installation, SCS recommends collecting data in the following format:

date/time the charge exited the kiln	Charge #	Kiln #	dimension	species	desired MC % (at the planer)	KilnScout® MC% at kiln shutdown	hot check MC %	planer MC% results
1/2/2007 4:30 AM	1001	1	2x4	SPF	15.0%	15.0%	17.2%	14.0%

Using a data collection method of this sort will allow SCS to establish a known offset between KilnScout® moisture readings and the planer mill (or cold check) readings. Note: KilnScout® MC% at kiln shutdown must be recorded before the kiln is shut down and vented.

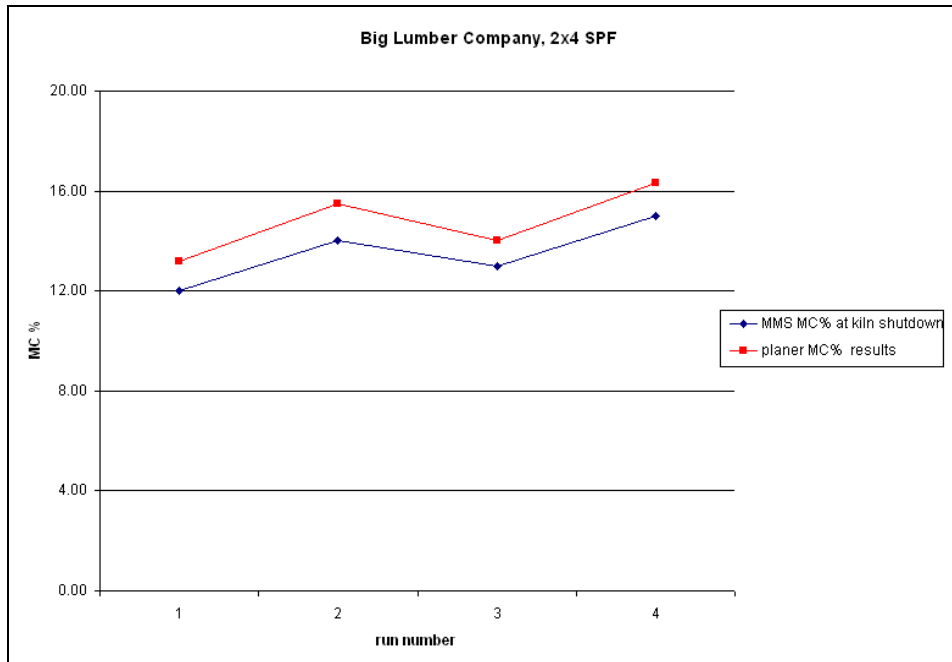
First 2 Weeks after Installation

During the first two weeks following installation, SCS recommends that the site continue kiln-drying per its normal procedures. The site should continue to dry per time-based recipes (or other protocol) while data is collected on each kiln.

After 2 weeks of data collection, SCS will review the data with the mill to establish a known moisture offset between KilnScout® and the planer mill meter (or hot check data).



Based on the collected data, SCS will generate a run chart to show the readings on the various meters, in the format shown below:



With this information, we can then establish a known offset between the meters. In the case shown above, KilnScout® tends to read approximately 1.1% less than the planer mill reads.

SCS will establish KilnScout® shutdown targets. In the case described above, a KilnScout® shutdown target of 13.9% should result in a planer mill reading of 15%, which is the desired planer mill MC for this mill.

Two Week Status Meeting

At the end of the first two weeks of operation, SCS will review the collected data and will:

- a. Generate shutdown moisture targets for the mill.
- b. Determine the moisture offset between the various metering methods

SCS will then conference call with the mill management to review the project status and to issue shutdown moisture targets.

With the moisture targets determined, the mill can then use KilnScout® to automatically shut down the kiln charges when they reach the appropriate target.

Two Weeks to Four Weeks after Installation

During this period, SCS recommends continuing data collection in the format described above. The additional data will be used to refine the moisture offset, and to generate any additional



moisture targets (such as specific targets by dimension). However, in this period, the KilnScout® moisture readings will control the kiln shutdown.

Four Week Status Meeting

SCS will again conference call with the mill management after 4 weeks of operation. If desired by the mill management, SCS will adjust the moisture model at the 4 week point to remove the offset between the meters.

Basic objectives at the 4 week point are to:

- a. Adjust the moisture model(s) if desired.
- b. Refine any remaining moisture offset between the metering methods.
- c. Issue refined/updated moisture targets for KilnScout®.

Moisture targets will typically be issued in a format as described below:

Product	M.C. Target
2x4, 2x6, 2x8	15.0%
2x10	17.0%
2x12	17.5%

After the 4 week status meeting, the System is fully commissioned and should require no further adjustment.

SCS Forest Product is dedicated to continuous quality improvement. Be sure that a remote connection is established to help us monitor your system to provide you with the highest quality of service.



APPENDIX A: Recommended Conduit Size

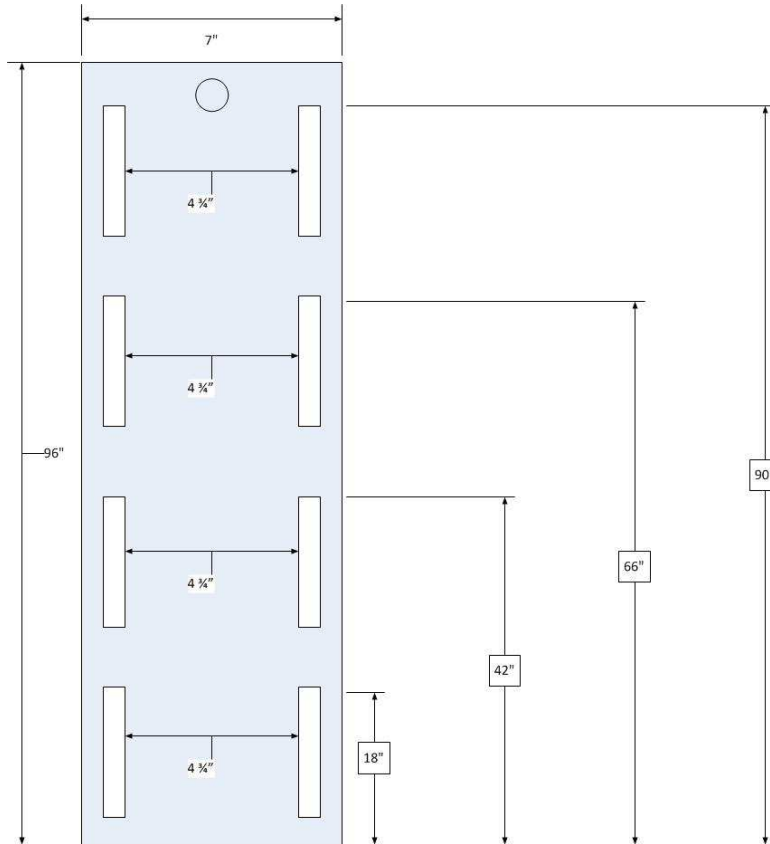
Assumptions

- Table lists the maximum number of cables in a conduit size

<u>Conduit Size</u>	<u>Actual Area</u>	<u>Max Cables (45% fill)</u>	<u>Max Cables (30% fill)</u>
½"	0.30	3	2
¾"	0.53	6	4
1"	0.86	10	6
1 ¼"	1.50	17	11
1 ½"	2.04	23	15
2"	3.36	39	26
2 ½"	5.86	68	45
3"	8.85	102	68
3 ½"	11.55	134	89
4"	14.75	171	114
5"	20.21	235	156



APPENDIX B: Plate Drawing



Each piece is
1/8" X 1/8"
Key Stock 12" Length

Notes:

- 1) All Plates are custom per package size
- 2) Total surface area is 682sqin +/- 2%
- 3) De-burr all edges

MATERIAL: 14G Stainless Steel Type 304
DIMENSIONS ARE IN INCHES
TOLERANCES: X ± .XX ±.020 .XXX ±.005
ANGLES: ± 1 DEGREE
FRACTIONS: UNLESS OTHERWISE SPECIFIED