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DRY-KILN CONTROLLER INSTALLATION DRAWINGS

model: netKCS
with KCU - MP32
Wireless Sensors

* * *

-

December 2017

Precautions

Safety guidelines

Please review installation documentation before starting installation work. Make sure you understand system components and how individual components interconnect. Contact Lignomat with questions and if unsure of certain installation or operating procedures.

This system may only function correctly and safely if it is transported, stored, set up and installed correctly, and operated and maintained as recommended.

ATTENTION

Only qualified personnel familiar with dry-kilns and associated control equipment should be allowed to plan or implement installation, start-up and subsequent maintenance of the system. Failure to comply may result in personal injury and/or equipment damage.

ATTENTION

Incorrectly installed equipment can result in component damage or reduction in product life. Wiring errors may result in malfunction of the system and/or personal injury.

Installation Precautions

- 1) Upon arrival inspect all equipment for any damage that may occur during transport.
- 2) It is recommended that all wire terminals be re-tightened prior to installation.
- 3) Install the control enclosures in dry and ventilated location, free of excessive dust and heat.
- 4) Securely install control enclosures in a stable upright position, which is free of vibration.
- 5) Install the control enclosures in an environment where the ambient temperature is between 15°F (-10°C) and 105°F (40°C). Do not allow enclosures to be exposed to direct sunlight.
- 6) Avoid installation near sources of electrical noise and always ground the enclosures to prevent electrical shock and to help reduce electrical noise.
- 7) A circuit breaker or other means of power disconnect should be installed between the power source and each controller enclosure. This circuit breaker should be coordinated to clear available fault current of the power source.
- 8) Separate conduit should be used for power circuits, control lines and communication lines.
- 9) Any cable splice located inside the kiln must be sealed 100% water-tight and secured to kiln structure.

Maintenance

Periodical maintenance will ensure long equipment life and proper operation. During maintenance period check and re-tighten all wire terminals. Remove excessive dust from electrical enclosure. Remove or insulate unused wires. Inspect cables for any physical damage and replace if required.

To ensure proper EMC readings EMC wafer holders and angle connectors should be cleaned of all deposits prior to each kiln charge or when false readings are suspected.

Transmitters must be periodically cleaned of all deposits around and between probe terminals to ensure proper EMC and wood moisture readings.

In-Kiln Equipment Operating Limitations

WARNING

Exceeding admissible temperature range may cause permanent damage to the equipment and will void warranty.

Data Collector (also known as Receiver or Receiver Station)

General:

Power Source: +8VDC to +25.5V DC
Admissible Temperature Range: -28°C to +85°C (-20°F to 185°F)

Temperature Measurement:

Local ambient Temperature: -40°C -> +127.9°C
Remote ambient Temperature: -40°C -> +127.9°C

Transmitter Station

General:

Power Source: Lithium Battery 3.6V (internal)
Admissible Temperature Range: -20°C to +85°C (0°F to 185°F)

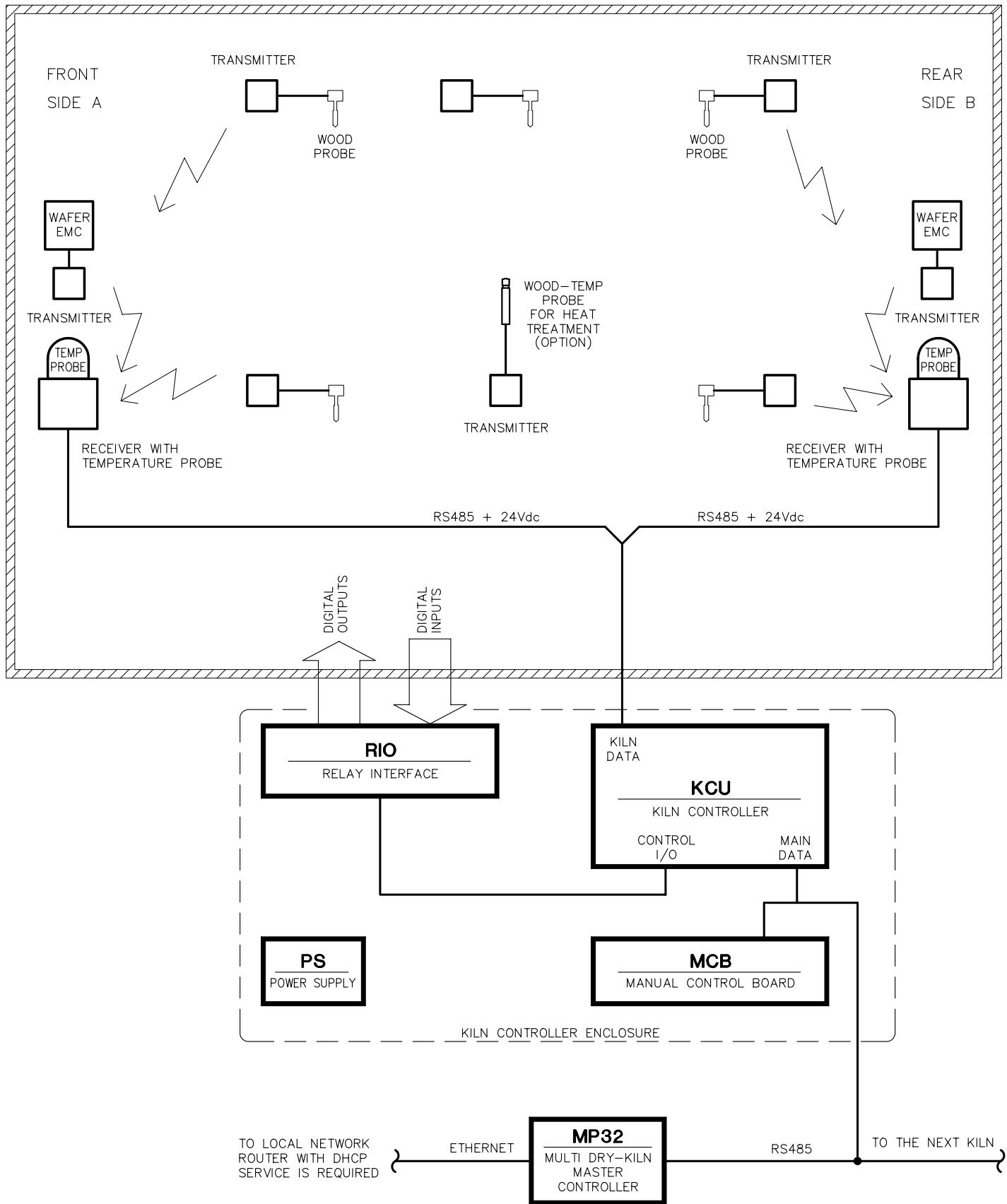
Transmitter:

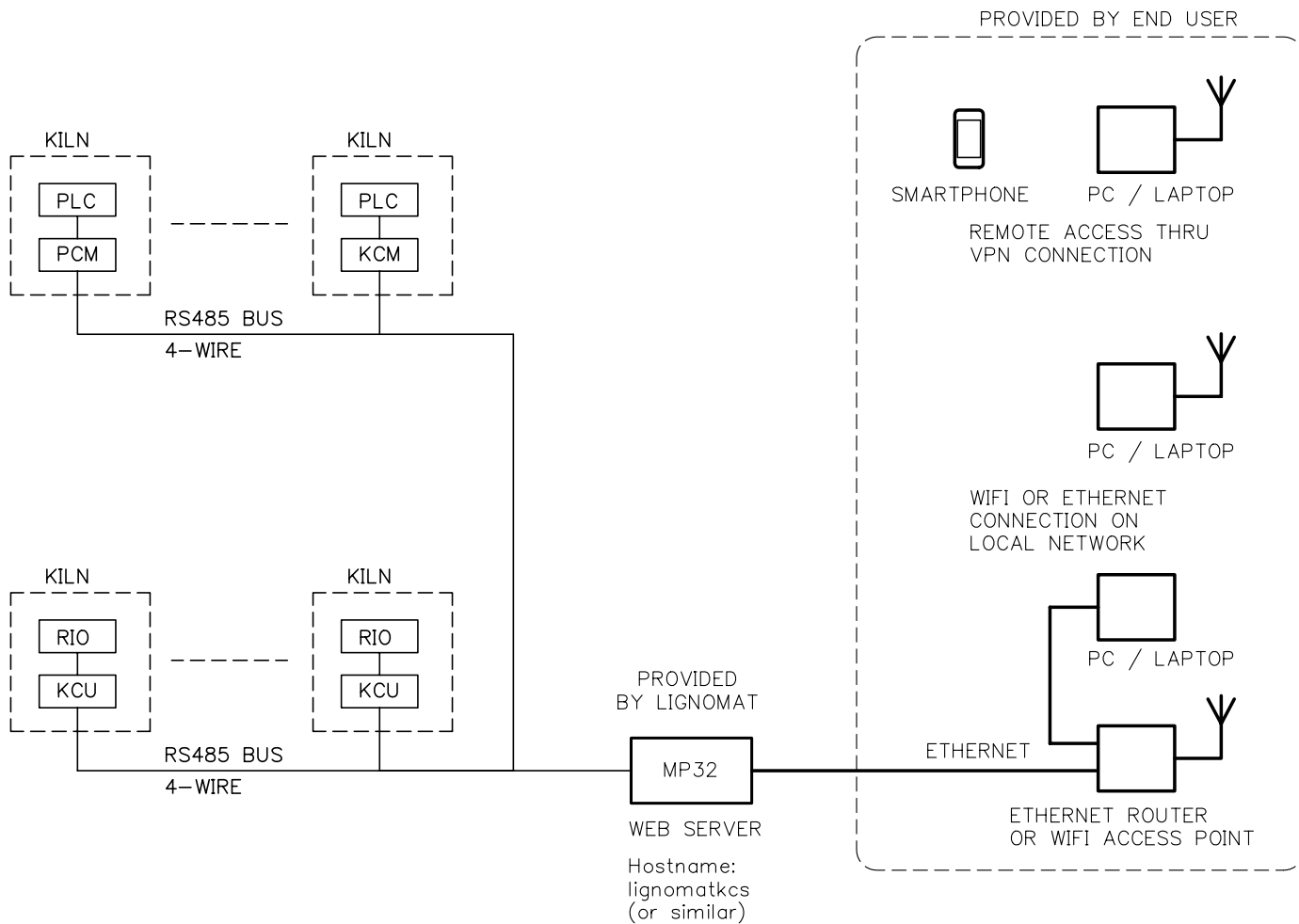
Operating Radio Frequency: 916.5MHz (US, Asia) 433.92MHz (EU)
Operating range: up to 20m (60ft)

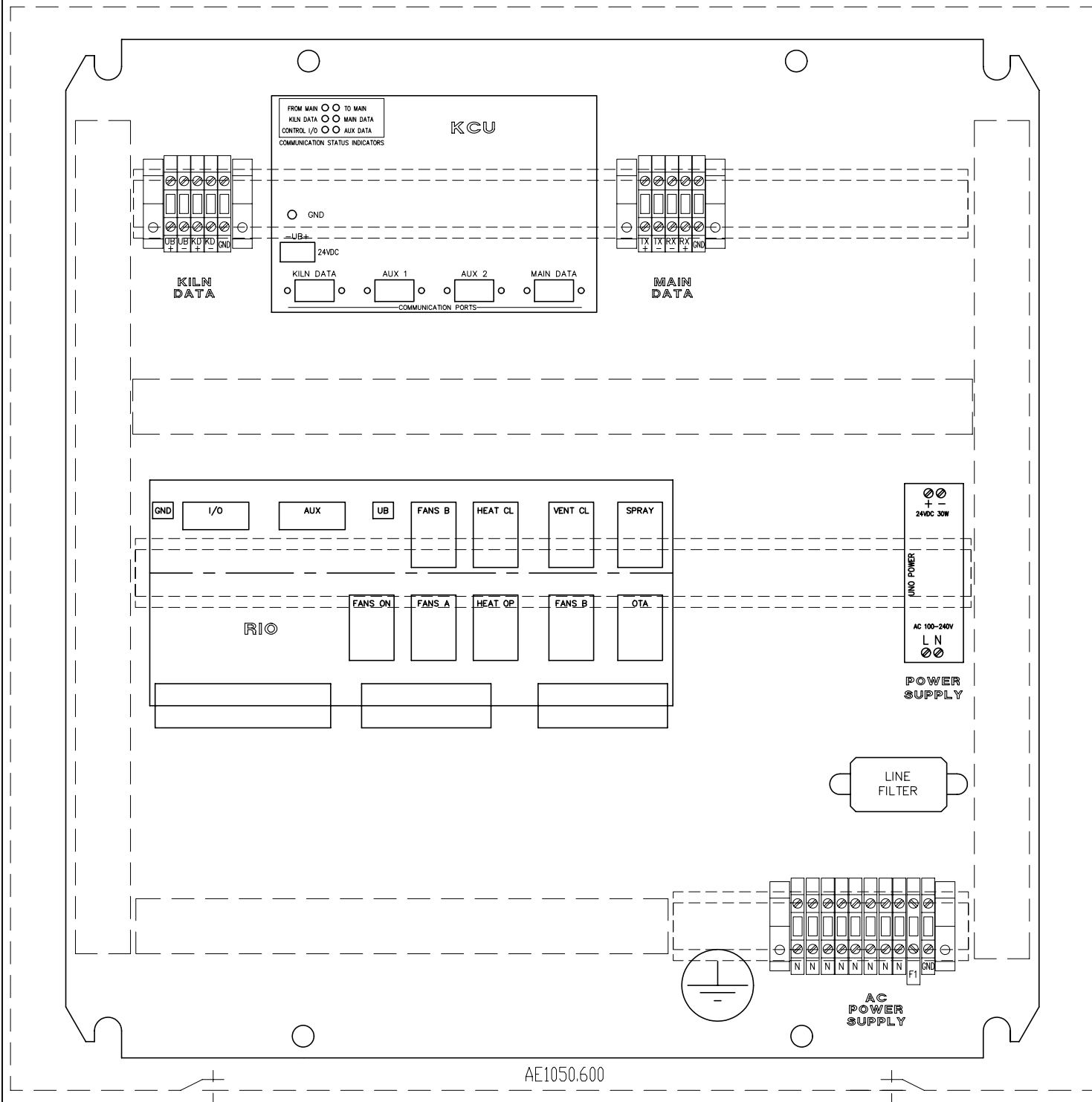
Moisture Meter:

Measuring Range: 0 -> 100% MC (Woodgroup 1)

KILN







NOTES :

02-21-05 68:39

H:\DRAWING\1SOURCE\KCU\KCU1-BOX8.DWG

JOB NO: CUSTOMER :

LEGEND:

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SHEET # **E2.0** OF

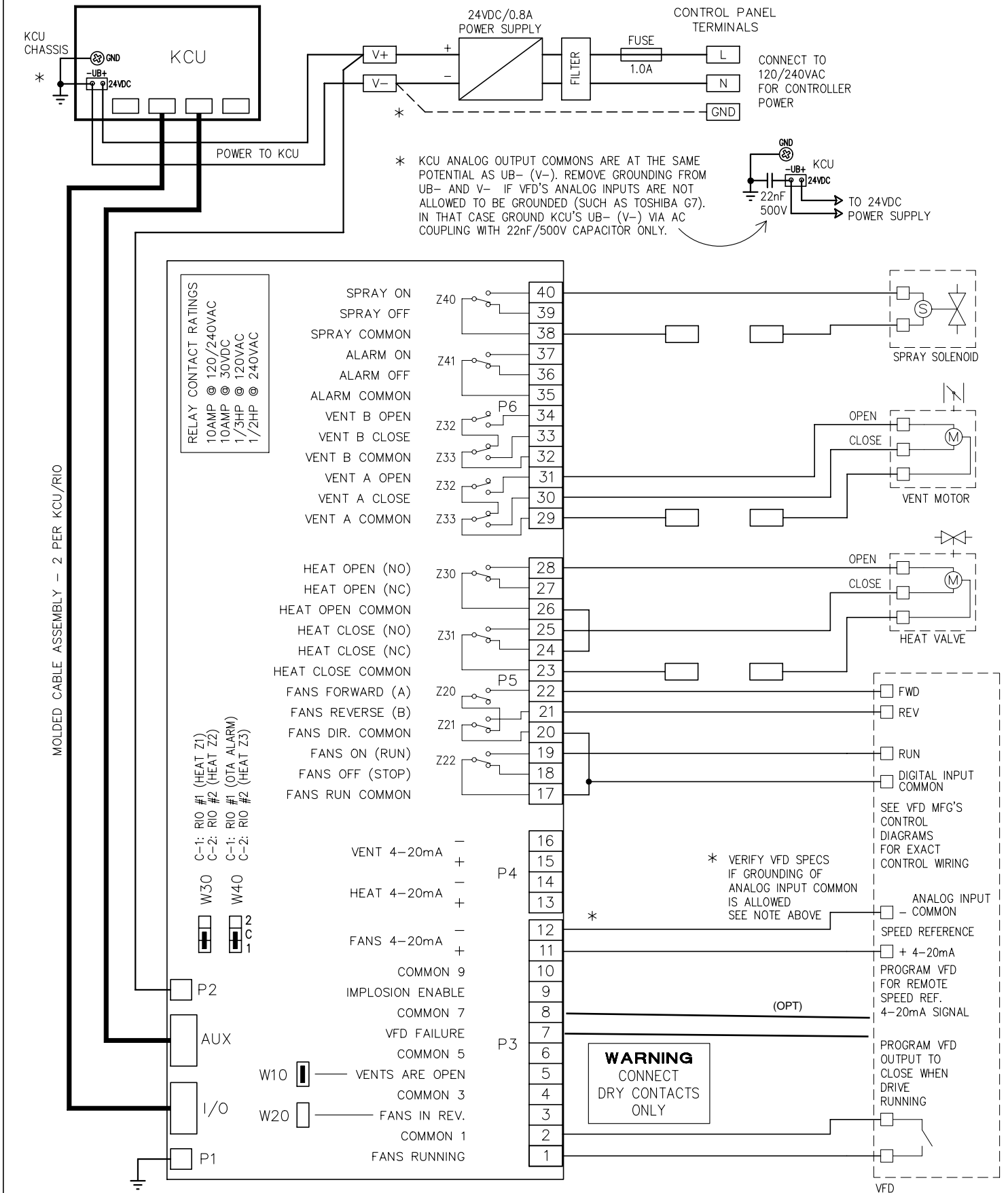
FILE # OTW-E20

REV

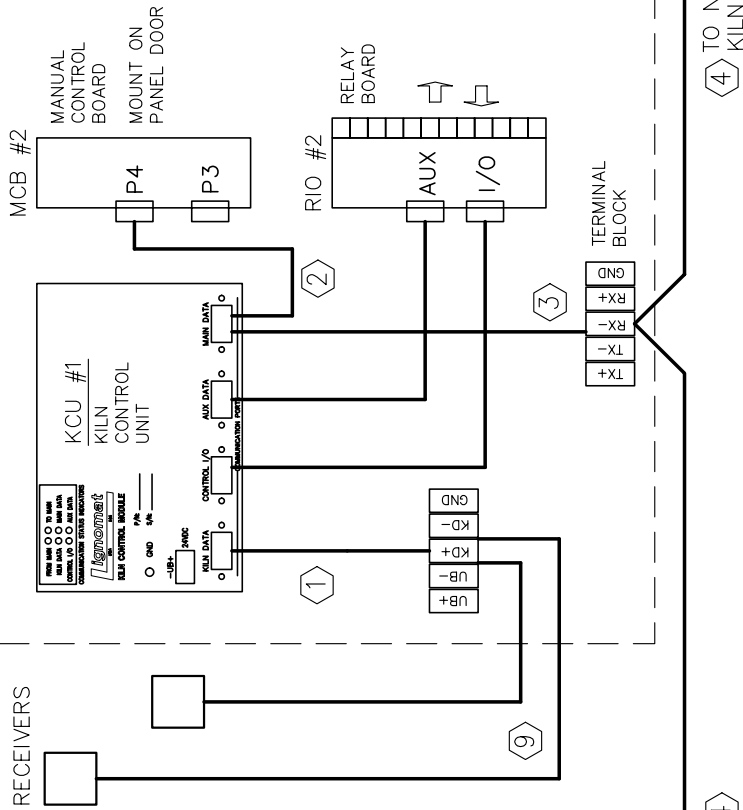
DATE
12-15-2016

DRAWN BY
PB

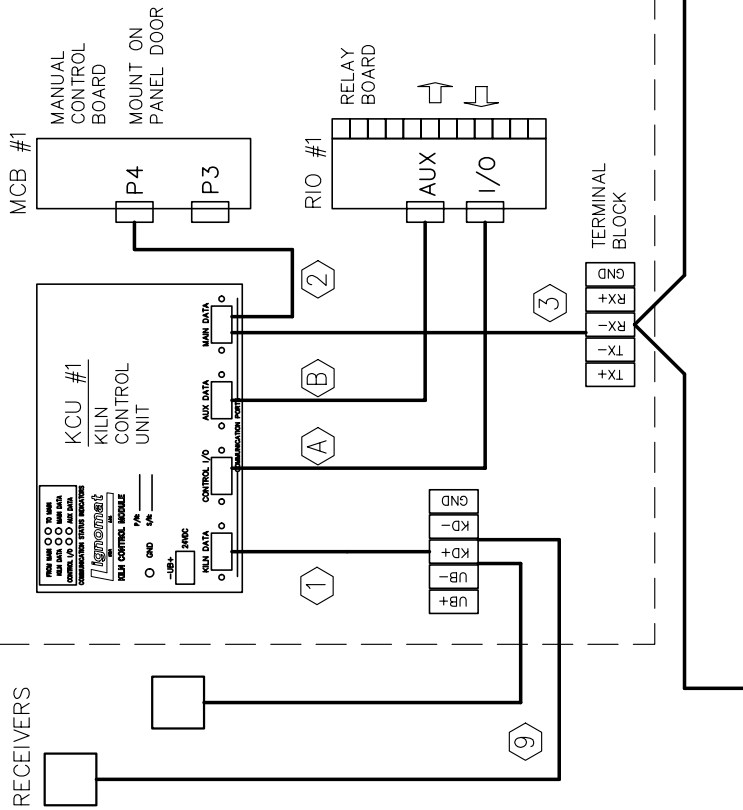
KCU ENCLOSURE LAYOUT



ENCLOSURE KILN 2



ENCLOSURE KILN 1



GENERAL NOTES:

WIRING SHOWN IS DIAGRAMATIC. ACTUAL WIRING SHOULD BE RUN IN A SEPARATE CONDUIT ON THE OUTSIDE OF THE KILN WALL.

SIZE CONDUIT TO ACCOMMODATE ALL COMMUNICATION CABLES.

KEEP COMMUNICATION CONDUIT AND CABLES AWAY FROM ANY HIGH ENERGY CONDUIT AND CABLES.

REFER TO CABLE ASSEMBLY DETAIL.

NOTES :

07-24-06 70:56
H:\DRAWINGS\1SOURCE\KCU\KCU-CAB30.DWG

JOB NO: CUSTOMER :

LEGEND:

(1) REFER TO DRAWINGS E3.1 AND E3.2 FOR DETAILS.

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SHEET # **E3.0** OF

FILE # KCU-CAB30

REV

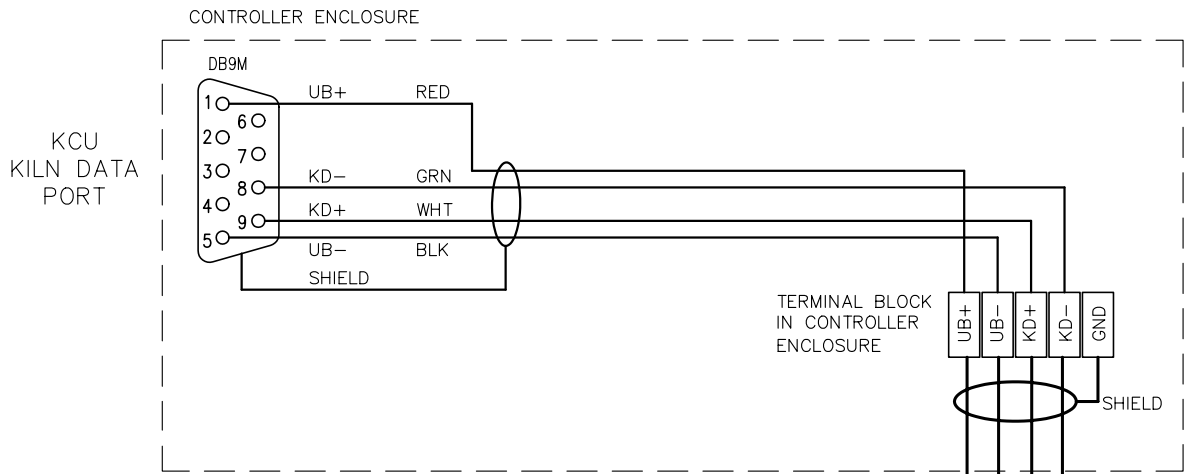
DATE 06/27/2004

DRAWN BY PB

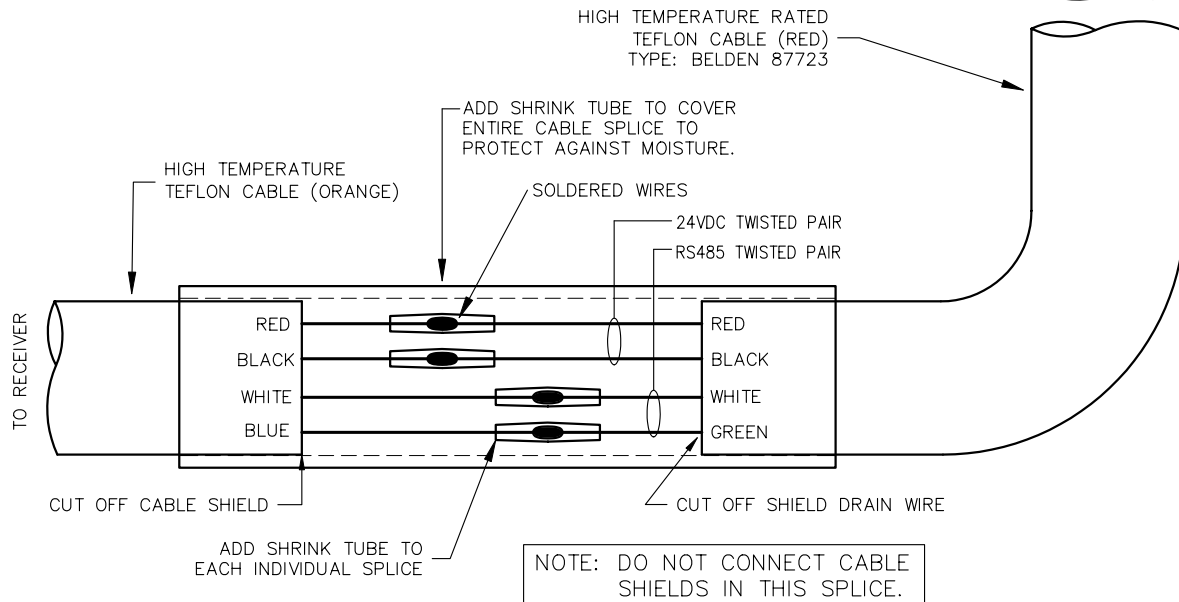
**MULTI DRYKILN CONTROLLER
DATA COMMUNICATION DIAGRAM**

MP 32

RS485



- 1 KCU MODULE (KILN DATA) TO IN-KILN MODULES
TWO TWISTED PAIR SHIELDED CABLE
TYPE BELDEN #87723 OR SIMILAR HIGH TEMPERATURE RATED



IMPORTANT

TO PREVENT PREMATURE CABLE AND CABLE SPLICE DETERIORATION CAUSED BY MOISTURE AND CHEMICALS FROM KILN AS WELL AS TEMPERATURE SWINGS, CABLE SPLICE MUST BE SEALED WATER-TIGHT AND SECURED TO STRUCTURE TO PREVENT ANY PHYSICAL DAMAGE.

- 9 RECEIVER CABLE SPLICE AND TERMINAL CONNECTION
TWO TWISTED PAIR SHIELDED CABLE
TYPE BELDEN #87723 OR SIMILAR HIGH TEMPERATURE RATED

NOTES :

07-31-08 96:38
H:\DRAWINGS\1SOURCE\KCU-E31.DWG

JOB NO: CUSTOMER :

LEGEND:

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SHEET # **E3.1** OF

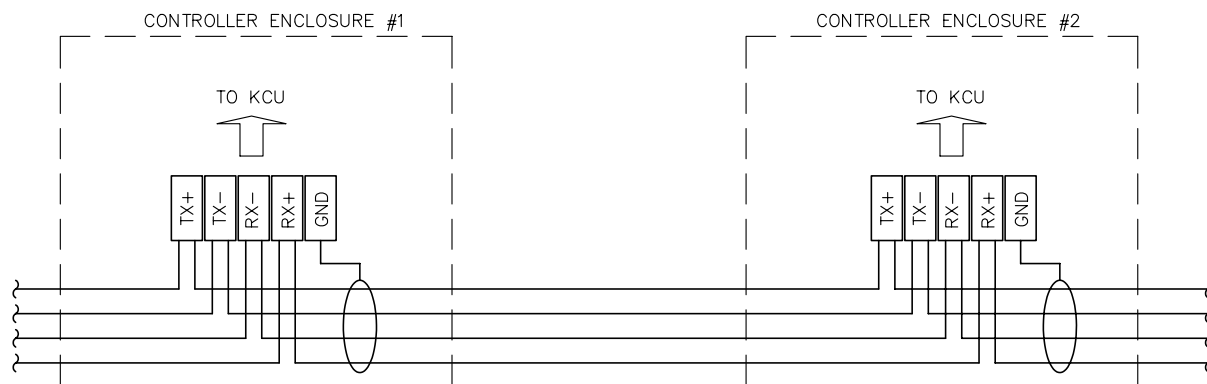
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REV

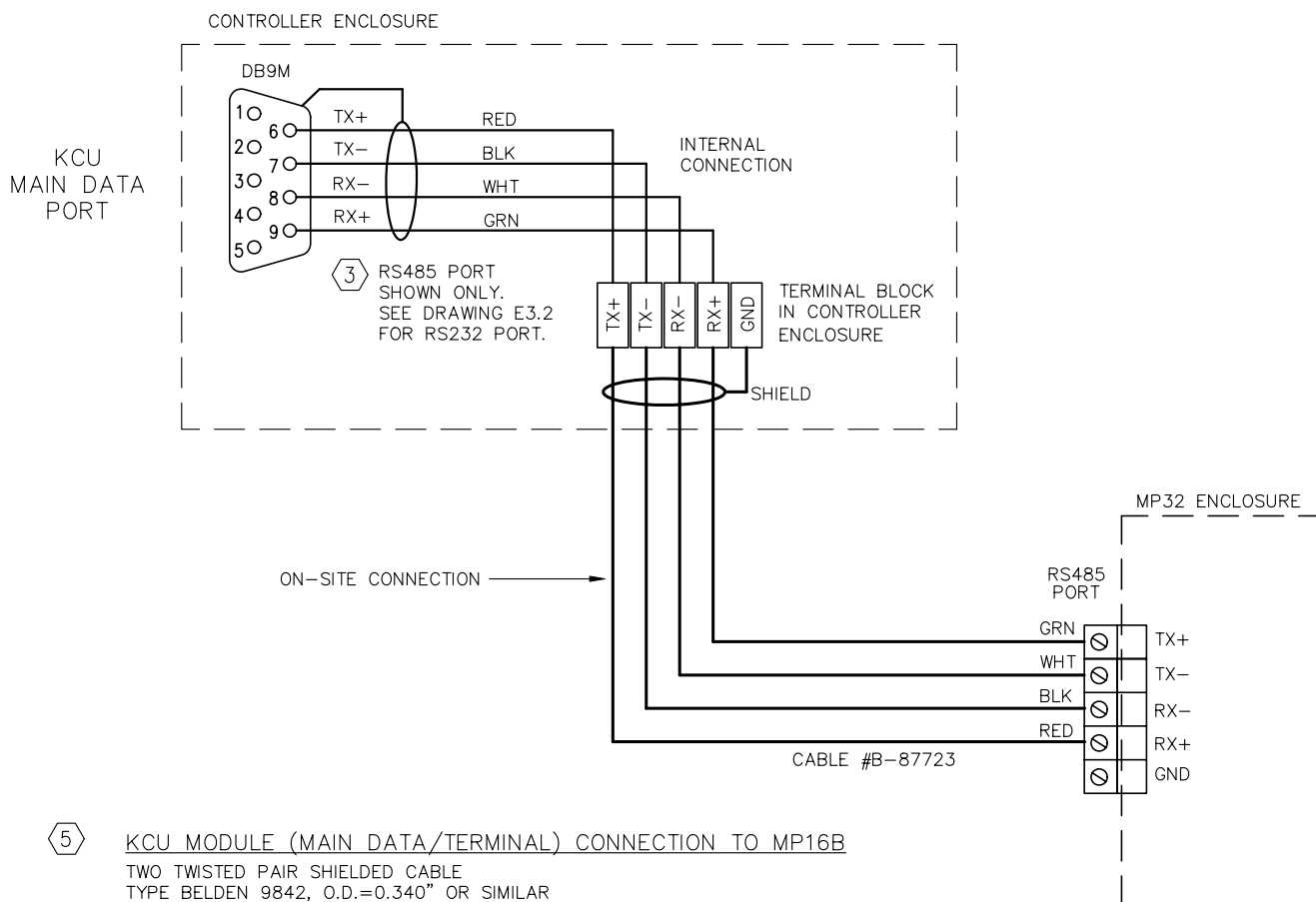
DATE
01/31/2006

DRAWN BY
PB

**MULTI DRYKILN CONTROLLER
KILN DATA CABLE DETAIL**



- 4 MAIN DATA PORT CONNECTION BETWEEN MULTIPLE ENCLOSURES/KILNS (IF SO EQUIPPED)
 TWO TWISTED PAIR SHIELDED CABLE
 TYPE BELDEN 9842, O.D.=0.340" OR SIMILAR



- 5 KCU MODULE (MAIN DATA/TERMINAL) CONNECTION TO MP16B
 TWO TWISTED PAIR SHIELDED CABLE
 TYPE BELDEN 9842, O.D.=0.340" OR SIMILAR

NOTE: ALL CABLES MUST BE SHIELDED.

NOTES :

12-15-10 96:22
 H:\DRAWINGS\1SOURCE\KCU\KCU-E32.DWG

JOB NO:

CUSTOMER :

LEGEND:

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SHEET # **E3.2** OF

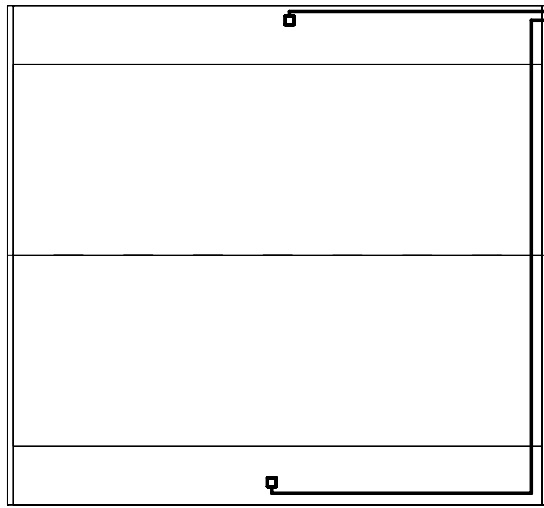
FILE # KCU-E32N

REV

DATE
 05/22/2015

DRAWN BY
 PB

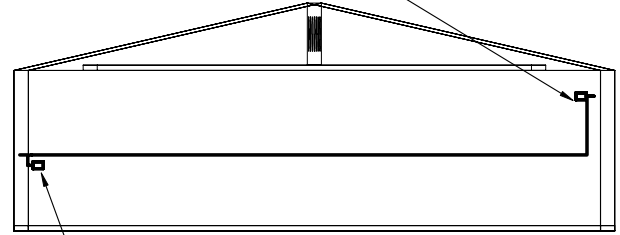
**MULTI DRYKILN CONTROLLER
 MAIN DATA CABLE DETAILS**



PLAN VIEW

WEATHER-PROOF AND CORROSION-PROOF JUNCTION BOX CAN BE USED TO SPLICE CABLE ON OUTSIDE KILN WALL.

MOUNT RECEIVER AWAY FROM HEATING COIL. MAXIMUM TEMPERATURE RECEIVERS CAN HANDLE IS 185°F (85°C).

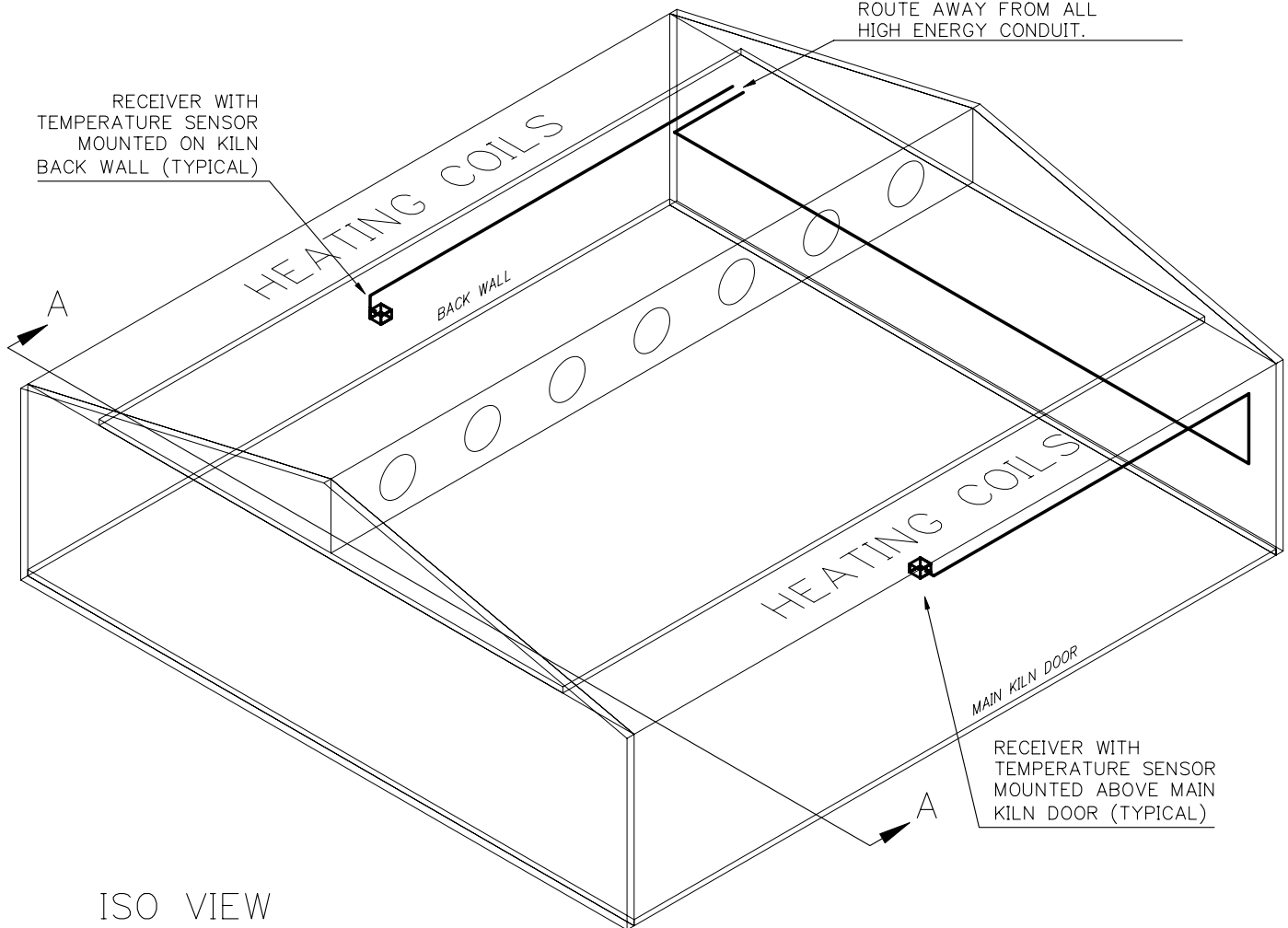


MOUNT RECEIVER AT EYE LEVEL

MOUNT RECEIVER IN SUCH WAY SO THEY ARE PROTECTED AGAINST ANY PHYSICAL DAMAGE AND SHIELDED FROM WATER OR STEAM SPRAY.

SECTION A

RUN CABLE FROM EACH RECEIVER TO CONTROL PANEL OR SPLICE AT SUITABLE POINT AND RUN SINGLE CABLE TO CONTROL PANEL. USE DEDICATED CONDUIT AND ROUTE AWAY FROM ALL HIGH ENERGY CONDUIT.



ISO VIEW

THIS PAGE IS FOR REFERENCE ONLY - ACTUAL KILN STRUCTURE MAY BE DIFFERENT.

NOTES :		LEGEND:		Lignomat PORTLAND USA LTD OREGON		SHEET # E4.0 OF	
04-01-06 7:10 H:\DRAWINGS\IN-KILN\RX-LAYOUT.DWG				DATE 02/16/2005		FILE # RX-LAYOUT REV	
JOB NO: CUSTOMER :		DRAWN BY PB		KILN RECEIVER LAYOUT			

NOTES:

KEEP ANTENNA WIRE STRAIGHT.

ORIENT TRANSMITTERS SO ANTENNA IS PERPENDICULAR TO THE DIRECTION TOWARDS THE RECEIVER(S).

FOR THE BEST RESULTS ALL ANTENNAE SHOULD HAVE THE SAME POLARIZATION; MEANING ALL SHOULD BE ORIENTED EITHER HORIZONTALLY OR ALL VERTICALLY.

RECEIVER MOUNTING PLATE
MOUNTED TO KILN WALL AT EYE LEVEL,
AWAY FROM ANY STRUCTURAL COLUMNS
Item #----

RECEIVER CABLE -
HIGH TEMPERATURE RATED
TEFLON COATED CABLE
Item #110

GREEN LED -
FOR TROUBLESHOOTING PURPOSE
INSTALL RECEIVER AT A HEIGHT
SO THE LED REMAINS VISIBLE

ANTENNA

KEEP ANTENNA
WIRE STRAIGHT

TEMPERATURE SENSOR
(FOR KILNS ONLY)

RECEIVER Item #303
MOUNTED ON THE TOP OR BOTTOM OF
MOUNTING PLATE. MOUNT THE SIDE WITH
TEMPERATURE PROBE CLOSE TO EDGE
OF PLATE TO ALLOW FOR BETTER AIR
FLOW AROUND TEMPERATURE PROBE.
SHIELD TEMPERATURE SENSOR FROM
HOT SPRAY AND DRIPPING WATER.

KILN BACK WALL

STRUCTURAL COLUMN

① EMC TRANSMITTER.
SECURE TO ALUMINUM
MOUNT MOBILE WITH SMALL
AMOUNT OF SILICONE
OR WIRE TIE

ALUMINUM MOUNT MOBILE ④
Item #----- ②

DIRECTION
TOWARDS
RECEIVER

ANTENNA
WIRE STRAIGHT

DIRECTION
TOWARDS
RECEIVER

KEEP ANTENNA WIRE STRAIGHT

TRANSMITTER MAINTENANCE

TO ENSURE ACCURATE READINGS
SURFACE BETWEEN AND AROUND
TRANSMITTER PROBE WIRES
MUST BE PERIODICALLY CLEANED
OF DEPOSITS. SCRAPE SOLIDS AND
WASH WITH SOLVENT SUCH AS
ALCOHOL OR ACETONE. APPLIES TO
MC AND EMC TRANSMITTERS

TRANSMITTER
PROBE WIRE PAIR
Item #306

③8 MC TRANSMITTER
Item #301

HANDLE TRANSMITTERS WITH CARE.
DO NOT REMOVE BANANA PLUGS
FROM WOOD PROBES OR WOOD
PROBES FROM LUMBER BY PULLING
ON THE TRANSMITTER. ALWAYS
USE PULLING TOOL TO EXTRACT
WOOD PROBE FROM LUMBER.

③9 WOOD PROBE PAIR

DRILL HOLES 5/32" DIA. (#21)

TWO HOLES HAVE TO BE DRILLED FOR THE PROBES WITH A 5/32"
DRILL BIT, 1-1/4" APART MAKING SURE THE PROBE WILL BOTTOM OUT
IN THE HOLE. TO HAMMER THE PROBE INTO THE BOARD PUT THE
PULLING TOOL ON THE PROBE HEAD. DO NOT PUT PIN THRU HOLE.
HAMMER ON TOP OF THE PULLING TOOL UNTIL THE TOOL TOUCHES
THE WOOD. THE PROBES ARE NOW PLACED CORRECTLY, SO THAT THE
PROBE HEADS DO NOT TOUCH THE WOOD AND PREVENT DRYING
PROCESS JUST ABOVE THE MEASURING POINT. THE TIP OF THE PROBE
SHOULD PENETRATE AT LEAST 1/3 OF THE BOARD THICKNESS.

④0 WOOD PROBE PULLING TOOL
(OPTIONAL)
Item #115

④1 WOOD PROBE TEMPLATE
(OPTIONAL)
Item #130

ANGLE CONNECTOR
Item #101

⑤ EMC SENSOR
Item #103
EMC WAFER
Item #104

WOOD PROBE TYPES

MEASURING DEPTH	PKA 1/2"	PKB 5/8"	PKC 1"	PKD 1-1/2"	PKE 2-5/8"
④2	④3	④4	④5	④6	④7

Item #117 118 119 120 121

NOTES :

LEGEND:

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SHEET # **E4.1** OF

FILE # ALL-WIRELESS

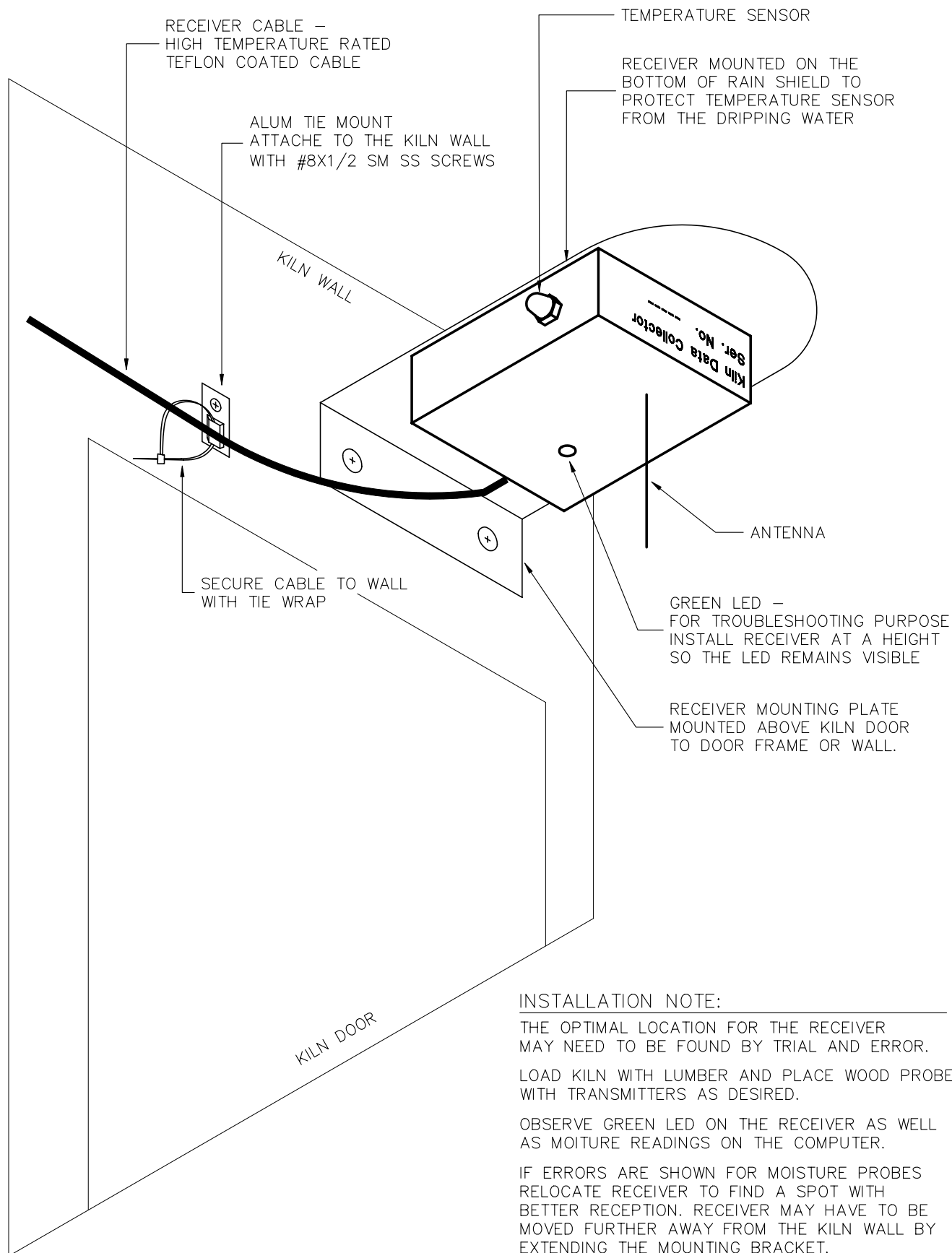
REV

DATE
01-26-2016

WIRELESS EQUIPMENT

JOB NO: CUSTOMER :

DRAWN BY
PB



NOTE: DETAIL SHOWN AS LOOKING FROM THE FLOOR UP.

INSTALLATION NOTE:

THE OPTIMAL LOCATION FOR THE RECEIVER MAY NEED TO BE FOUND BY TRIAL AND ERROR.

LOAD KILN WITH LUMBER AND PLACE WOOD PROBES WITH TRANSMITTERS AS DESIRED.

OBSERVE GREEN LED ON THE RECEIVER AS WELL AS MOITURE READINGS ON THE COMPUTER.

IF ERRORS ARE SHOWN FOR MOISTURE PROBES RELOCATE RECEIVER TO FIND A SPOT WITH BETTER RECEPTION. RECEIVER MAY HAVE TO BE MOVED FURTHER AWAY FROM THE KILN WALL BY EXTENDING THE MOUNTING BRACKET.

OBSERVE THE GREEN LED ON THE RECEIVER; TRY TO FIND LOCATION WHERE LED IS MAINLY ON.

NOTES :

LEGEND:

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LTD

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SHEET # **E4.2** OF

FILE # RX-MOUNT2

REV

DATE

04/18/2001

DRAWN BY

PB

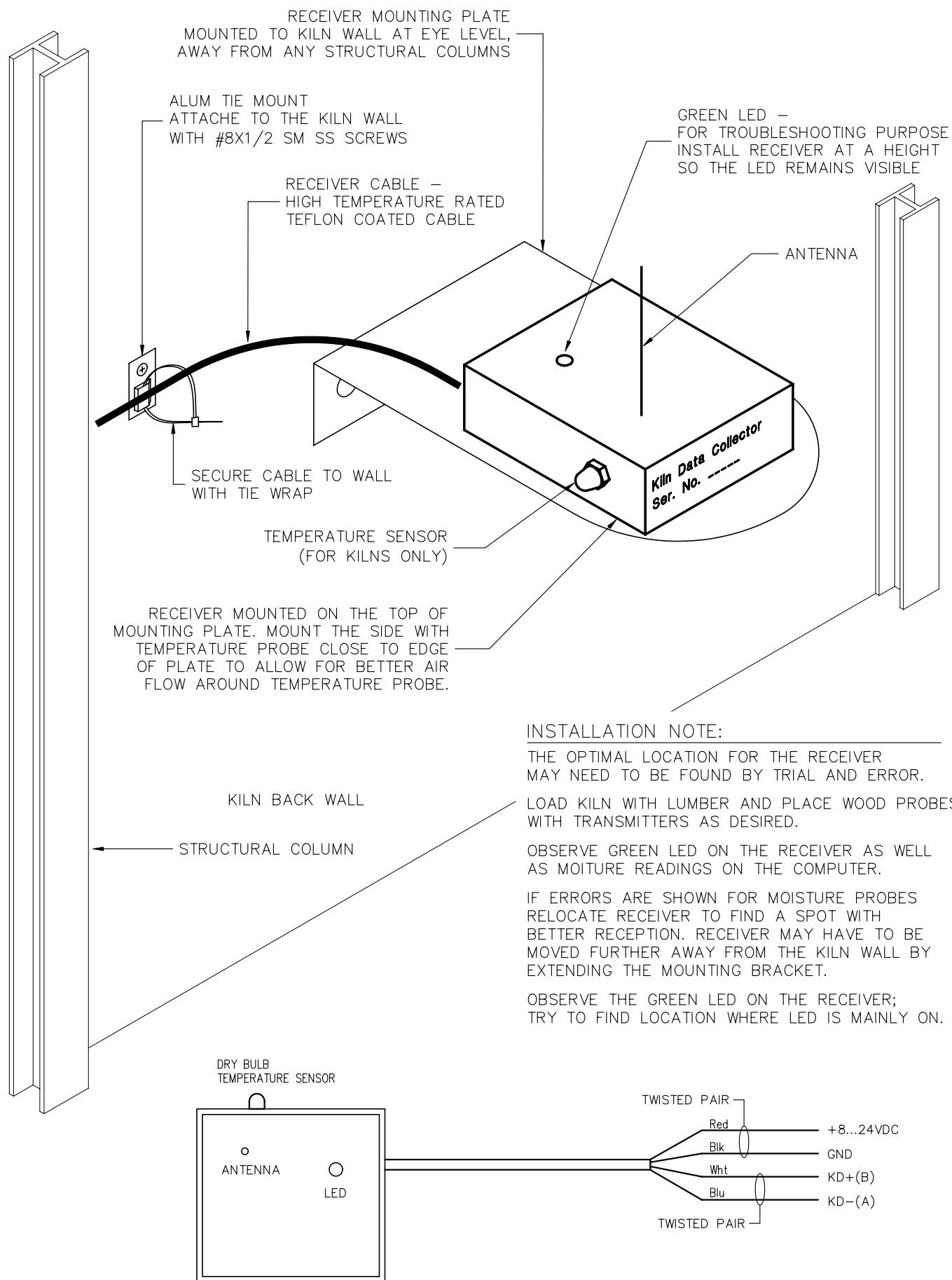
RECEIVER ABOVE KILN DOOR MOUNTING DETAIL

10-14-05 8:34

H:\DRAWINGS\1SOURCE\IN-KILN\RX-MOUNT2.DWG

JOB NO:

CUSTOMER :



INSTALLATION NOTE:

THE OPTIMAL LOCATION FOR THE RECEIVER
MAY NEED TO BE FOUND BY TRIAL AND ERROR.

LOAD KILN WITH LUMBER AND PLACE WOOD PROBES
WITH TRANSMITTERS AS DESIRED.

OBSERVE GREEN LED ON THE RECEIVER AS WELL
AS MOITURE READINGS ON THE COMPUTER.

IF ERRORS ARE SHOWN FOR MOISTURE PROBES
RELOCATE RECEIVER TO FIND A SPOT WITH
BETTER RECEPTION. RECEIVER MAY HAVE TO BE
MOVED FURTHER AWAY FROM THE KILN WALL BY
EXTENDING THE MOUNTING BRACKET.

OBSERVE THE GREEN LED ON THE RECEIVER;
TRY TO FIND LOCATION WHERE LED IS MAINLY ON.

NOTES :

10-14-05 30:28
H:\DRAWINGS\1SOURCE\IN-KILN\RX-MOUNT.DWG

JOB NO: CUSTOMER :

LEGEND:

PORTLAND

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USA LTD

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SHEET # **E4.3** OF

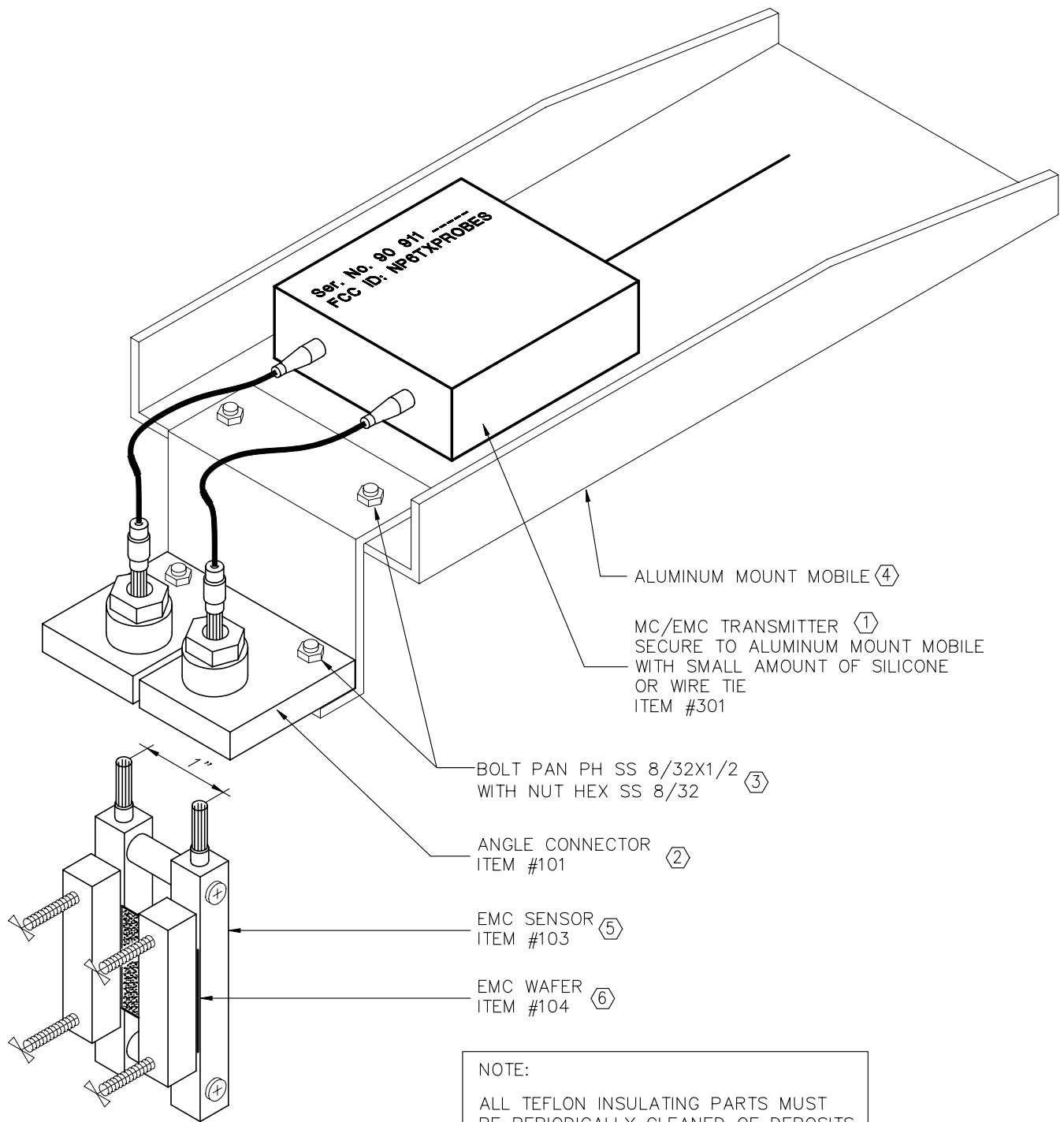
FILE # RX-MOUNT

REV

DATE
04/18/2001

DRAWN BY
PB

**RECEIVER MOUNTING DETAIL
BACK WALL**



NOTES :

04-04-01 3:29
H:\DRAWING\1PLC\STD\IN-KILN\EMC-RF2.DWG

JOB NO: CUSTOMER :

LEGEND:

PORTLAND

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SHEET # **E4.4** OF

FILE # EMC-RF2

REV

DATE
05/03/2012

DRAWN BY
PB

**WIRELESS EMC SENSOR
MOBILE STATION MOUNTING DETAIL**

HANDLE TRANSMITTERS WITH CARE.

DO NOT REMOVE BANANA PLUGS FROM WOOD PROBES OR WOOD PROBES FROM LUMBER BY PULLING ON THE TRANSMITTER. ALWAYS USE PULLING TOOL TO EXTRACT WOOD PROBE FROM LUMBER.

TO CONSERVE TRANSMITTER BATTERY CONNECT PROBE WIRES TOGETHER IF TRANSMITTER WILL NOT BE USED FOR LONGER PERIOD. THIS IS ALSO REQUIRED WHEN SHIPPING TRANSMITTER BY AIR AS SHORTING PROBE WIRES WILL TURN OFF TRANSMITTING CIRCUITRY.

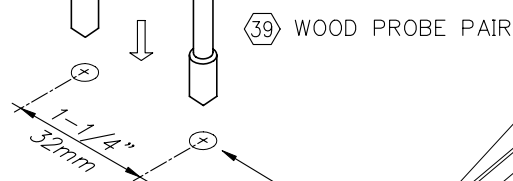
Kiln Data Transmitter
Ser. No. _____

38 MC TRANSMITTER

TWO HOLES HAVE TO BE DRILLED FOR THE PROBES WITH A 5/32" DRILL BIT, 1-1/4" APART TO A DEPTH SO AS THE PROBE TIP WILL BOTTOM OUT IN THE HOLE.

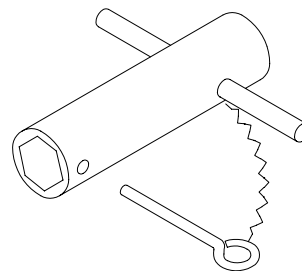
TO HAMMER THE PROBE INTO THE BOARD PUT THE PULLING TOOL ON THE PROBE HEAD. HAMMER ON TOP OF THE PULLING TOOL UNTIL THE TOOL TOUCHES THE WOOD.

THE PROBES ARE NOW PLACED CORRECTLY, AND THE PROBE HEADS DO NOT TOUCH THE WOOD WHICH WOULD PREVENT DRYING PROCESS JUST ABOVE THE MEASURING POINT. THE TIP OF THE PROBE SHOULD PENETRATE AT LEAST 1/3 OF THE BOARD THICKNESS.



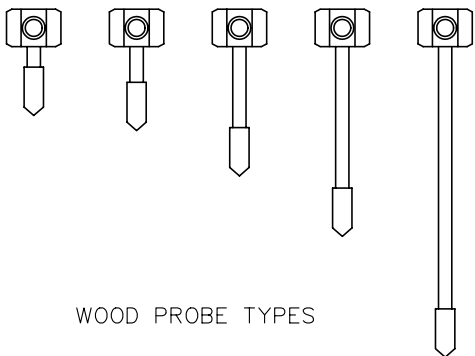
DRILL HOLES 5/32" DIA. (#21 or 4mm)

LUMBER

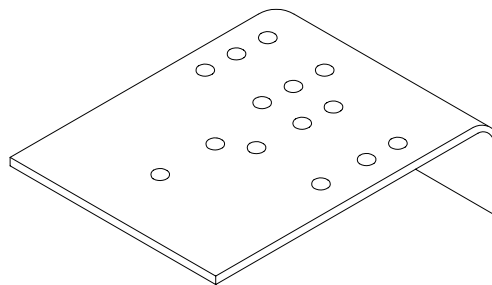


40 WOOD PROBE PULLING TOOL (OPTIONAL)

PKA 1/2" PKB 5/8" PKC 1" PKD 1-1/2" PKE 2-5/8" - MEASURING DEPTH



WOOD PROBE TYPES



41 WOOD PROBE TEMPLATE (OPTIONAL)

NOTES :

03-22-05 9:13
H:\DRAWING\SOURCE\IN-KILN\MC-RF3.DWG

JOB NO: CUSTOMER :

LEGEND:

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SHEET # **E4.5** OF

FILE # MC-RF3

REV

DATE
08/22/2006

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PB

**WIRELESS WOOD PROBE
AND ACCESSORIES**

Kiln Control Unit (KCU) – Controller Setup

GENERAL

The KCU is based on the PCM but comes with I/O-capabilities. There is no need for an external I/O-Processor like the LIO or a PLC.

The KCU can control kilns with one heat zone and up to 8 MC-stations. No DH kilns.

It cannot determine steam pressure and steam flow readings or actuator positions.
Therefore it's not possible to do differential venting for integrating actuators.
No recorder outputs are available.

Most other features of the KCU are equal to those of the PCM, see following differences:

DATAACQUISITION

Temperature values:

The temperature values (2) can only originate from Receiver Stations with Temp. Converters.
No analog temperature sensors (Pt100).

EMC-values:

The EMC values (2) can only originate from Wireless EMC-Stations.
No wirebound EMC-Stations.

MC-values:

The MC values (8 max) can only originate from Wireless MC-Stations.
No wirebound MC-Stations.

FAN CONTROL

In Bypass mode, the fan control outputs will never switch fan direction without a delay.
Fans will be turned off for 3min before switching direction.
This is the case in Automatic mode as well as in Manual override mode.

EXTERNAL CONNECTIONS

Note: **Use shielded cable for all connections!**
 RS485-communication cables must be „twisted pair“ and shielded!
 At KCU, solder shield wire to D-Sub.connector and use metal plated hoods.
 Where possible, also connect shield wire at far end of cable to earth ground.

Power Supply: (for KCU and external relays)

+: Ub+	24V +/-5%
-: Ub-	24V +/-5%, also connect to Ground Terminal provided on box

Kiln Data: (2 Receiver stations (odd and even SN))

Pin 1: UR	Supply (+)
Pin 5: GNDR	Supply (-)
Pin 9: Rx/Tx+	RS485 (+)
Pin 8: Rx/Tx-	RS485 (-)

Main: (Control PC and/or Manual Control Board)

Pin 4: IGND	Ground for (isolated) RS485
Pin 9: Rx+	Rx+ of (isolated) RS485
Pin 8: Rx-	Rx- of (isolated) RS485
Pin 6: Tx+	Tx+ of (isolated) RS485
Pin 7: Tx-	Tx- of (isolated) RS485

Pin 5: GNDR	Ground for RS232
Pin 3: Rx	Rx of RS232
Pin 2: Tx	Tx of RS232

Pin 1: UR	Supply (+) for Manual Control Board
Pin 5: GNDR	Supply (-) for Manual Control Board

I/O (male connector):

	Connect digital inputs to GNDR for corresponding function.
Pin 4: DI1	Verification Fans are running
Pin 8: DI2	Verification Fans are running in reverse direction (only needed in Bypass mode)
Pin 9: DI3	VSD failure
Pin 5: DI4	Activation of Implosion safety mode
Pin 6: DI5	Verification vents are open (only needed in Implosion Safety mode)
Pin 2: DI6/AO2	Activation of Bypass mode instead of VSD mode (W46: C-D) 4-20mA Speed signal (VSD mode only) (W46: C-A)
Pin 1: AO3	4-20mA Heat signal
Pin 3: AO4	4-20mA Vent signal
Pin 7: GNDR	Return for digital inputs / analog outputs

Aux (female connector):

	Connect relays (supplied by Ub+) to corresponding output.
	<u>Note:</u> Unfused "open collector" outputs! Max. current 50mA!
Pin 1: DO1	Open Heat valve
Pin 7: DO2	OT-alarm
Pin 3: DO3	Open Vents
Pin 8: DO4	Close Vents
Pin 9: DO5	Spray On
Pin 5: DO6	Close Heat valve
Pin 4: DO7	Fans On, direction A
Pin 2: DO8	Fans On, direction B
Pin 6: UR	don't use for relays

SETUP of the KILN CONTROL UNIT (KCU)

1. Data acquisition

Jumpers:

W1: open
W2: closed
W3: open
W4: open

W33: closed
W34: open
W35: closed
W36: closed
W37: open
W38: open
W39: open
W40: closed

Rotary switches:

S: 1
T: don't care
H: Amount of MC-sensors existing in the kiln

S11, S12 set according to the location of the Receiver Stations in the kiln:

Receiver Station with odd Serial number mounted on side A and
Receiver Station with even Serial number mounted on side B:
S11=1 and S12=2

Receiver Station with even Serial number mounted on side A and
Receiver Station with odd Serial number mounted on side B:
S11=2 and S12=1

S13, S14 set according to W19, W24 and the location of the Receiver Stations in the kiln:

W19 open:
S13, S14=0

W19 closed:
Receiver Station with odd Serial number mounted on side A and
Receiver Station with even Serial number mounted on side B:
W24 open: S13=7 and S14=8
W24 closed: S13=7 and S14=0: If wet bulb at Receiver Station with odd SN
S13=0 and S14=7: If wet bulb at Receiver Station with even SN

Receiver Station with even Serial number mounted on side A and
Receiver Station with odd Serial number mounted on side B:
W24 open: S13=8 and S14=7
W24 closed: S13=7 and S14=0: If wet bulb at Receiver Station with odd SN
S13=0 and S14=7: If wet bulb at Receiver Station with even SN

S15, S16: 0

2. Kiln control

Jumpers:

W45: C-D

W46: C-D: DI6 used (Bypass mode)

W47: C-A

W48: C-A

W46: C-A: AO2 used (VSD mode)

W5 open: 9600Bd for comm. at Main Port

W5 closed: 19.2kBd

W6 open: Frequent fan shut-downs generate OTW6 closed: OT-safety feature inactive

W9 open: No reversing to side with bad T/EMC W9 closed: Drying process off if any bad T/EMC

W10 open: Implosion fncts. active at reversal W10 closed: No impl. functions at fan reversal

W11 open: No auto clear of OT-alarm W11 closed: Auto clear after 4h 15min

W12 open: Integrating heat actuator W12 closed: Nonintegrating

W13 open: Integrating vent actuator W13 closed: Nonintegrating

W14 open: Nonpowered vents W14 closed: Powered vents

W15 open: Combined vent control W15 closed: Differential (nonint.actuator only)

W16: open

W17: open

W18: open

W19 open: Wafer as EMC-sensor

W19 closed: Wet/Dry bulb

W20: open

W21: closed

W22 open: No errors for low MCs

W22 closed: Low MCs generate errors

W23: don't care

W24 open: Separate sensors for WBA, WBB

W24 closed: Sensor for WBA also used for WBB

W27 open: Low end EMC limit 3.0%

W27 closed: Low end EMC limit 2.0%

W41 open: Kiln Data port: No term.resistor

W41 closed: Term.resistor between RS485-lines

W43 open: Kiln Data port: No pullup resistor

W43 closed: Pullup resistor on RS485-line (+)

W44 open: Kiln Data port: No pulldown resistor W44 closed: Pulldown resistor on RS485-line (-)

Rotary switches:

S1, S2: Individual Kiln number

S1: tens, S2: units

INDICATORS (LEDs) of the KILN CONTROL UNIT (KCU)

External LEDs:

Green LED "Main In" :

Flashing when receiving data from the Host.

Yellow LED "Main Out":

Flashing when sending data to the Host.

Red LED "Kiln Data error":

Off: Communication with receivers OK.

On: No valid reply from at least one receiver.

Red LED "Main Data error":

Off: KCU received valid data from the Host or Manual Control Board within the last 1min.

On: KCU received no valid data within the last 1min.

Red LED "I/O data error":

Off: Internal communication (kiln data) OK between DCM and CM

On: Communication problem between CM and DCM

Red LED "Aux data error":

Off: Internal communication (I/O-data) OK between CM and DCM

On: Communication problem between CM and DCM

Internal LEDs:

Red LED D30:

Flashing in irregular intervals indicates normal operation of DCM.

Yellow LED D30:

Flashing in 1sec intervals indicates normal operation of CM.

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INSTRUCTIONS AND TIPS ON HOW TO USE WIRELESS PROBES IN KILNS

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SYSTEM

The Wireless Probe System features individual, battery-powered, potted MC-Transmitter Stations for each MC or EMC station, transmitting the readings they determine by radio frequencies to at least one Receiver Station. It replaces the conventional method of connecting probes or sensors via long Teflon-coated cables to a measuring unit.

The system can be installed in dry kilns, it has been designed to withstand hot and corrosive conditions existing there. The components used are specified for ambient temperatures of up to 85°C (185°F) and the circuitry is potted in a highly insulating epoxy compound with maximum hydrolytic stability protecting it against high ambient air humidity.

PLACING TRANSMITTERS IN THE LUMBER:

The MC-Transmitter Stations can either be permanently connected to an EMC-Station or to electrodes that are placed in wood to measure the Moisture Content.

The electrodes must be placed in the wood in predrilled holes of 3mm (5/32") at a distance of 30mm (1 1/4").

To achieve maximum range, the MC-Transmitter Station should be placed in such a way, that the stub antenna is perpendicular to the surface of the ground.

1. Don't "bury" them in the packs. They need some "air" between them and the Receivers. If they are completely surrounded by wet lumber, then the radio frequency signal will be weakened too much. Placing the packs in the kiln with a small gap between each other not only improves airflow but also opens up an unobstructed path for the radio signal.
2. Place the Transmitters at about the same elevation as the Receivers are mounted. This will keep the Transmitters closer to the Receivers and there will be less wood between Transmitters and Receivers.
3. Position Transmitters so that the antennas are pointing outwards from the pack. If the sticker space is too small, letting the Transmitters hang from the wires is fine as long as there is no constant swinging due to ventilation.
4. When the message "MC out of range" is displayed on the PC this can indicate that the reading is too high or too low or it is changing too fast. But it can also indicate that the Receivers in the kiln cannot pick up the signal from the Transmitter that generates the MC-reading. This is the main reason why this message is being generated.

When the message is generated because no new readings are received from a Transmitter, then the last valid reading will continue to be displayed. This value might be very different from the actual MC-reading. It might be the low value generated with open probe wires before the Transmitter was placed in the lumber.

If the average MC is used for determining the desired values from the schedule, then all invalid MC-readings will be deactivated by the control system. The average MC is then no longer based on these MC-readings.

5. Make sure you have all readings on display without "MC out of range" messages BEFORE starting the kiln. If these messages are displayed at this time, then it is very unlikely that they will disappear after the kiln has been started.

If many "MC out of range" messages are displayed, especially at the time when the kiln has not even been started, then the Transmitters are probably "buried" too deep in the lumber. If it's not feasible to leave a small gap between the packs, then place at least 2 Transmitters on the OUTSIDE of the lumber packs, one in the front and one in the back of the kiln. This will make sure you have 2 MC-readings at the beginning of the kiln charge when the lumber is wet and when Transmitter signals originating from within the packs might be unreliable. Else there is the chance of a kiln shutdown due to dropout of all wood probes.

Readings from these 2 Transmitters can be used for the average MC in the first part of the drying schedule. When more or all wood probes recover, the average MC can be based on the readings coming from all valid Transmitters placed within the packs.

HANDLING OF TRANSMITTERS:

The Transmitter has been designed for everyday use in a harsh kiln environment. However, damage (mechanical and to the circuitry) can occur if these guidelines are not followed to avoid conditions of abuse:

1. The admissible temperature range of the Transmitters (and also the Receivers) is -20°C to +85°C (0°F to 185°F). Your control system should limit the temperature in the kiln to a maximum of 85°C (185°F). However, manual control of heat and spray can lead to temperatures in excess of 85°C (185°F). Extended use of the wireless modules above 85°C (185°F) will damage the circuitry. Temperatures above 100°C (212°F) are not only damaging but also dangerous.

WARNING: FIRE, EXPLOSION AND BURN HAZARD!

Every Transmitter contains a Lithium Battery which is not replaceable or rechargeable. Transmitters MUST NOT be connected to anything else but the wafer in an EMC-Station or wood to prevent the battery from getting charged. Do not heat Transmitters above 100°C (212°F), crush or incinerate.

2. The Lithium Battery can only take mechanical shocks to a certain degree. A free-fall of a Transmitter on a hard surface can lead to internal short circuits of the battery. As a consequence the battery is drained and the Transmitter will fail. When Transmitters get stuck between the boards during the drying process in the kiln, they must not be freed by means of a hammer or the like for the same reason.
3. It should be generally avoided to get the Transmitters stuck between boards because this can also lead to excessive mechanical stress for the battery. When in doubt it's better to have the Transmitters hang from their probe cables.
4. The probe wires are there to connect the Transmitter to the probes. They are not intended to be used as a pulling device when the Transmitter gets stuck in or to the lumber. Don't disconnect the wires from the probes by yanking on the Transmitter.
5. The connectors of the Transmitters are parts subject to wear and tear. They must be checked regularly and replaced if necessary.

IMPORTANT NOTES:

Transmitters must be deactivated whenever shipped by air, to make sure they don't interfere with air traffic communications. Shorting out the sensor leads will deactivate the Transmitter.

Transmitter function should be checked at least every 3 months or whenever false readings are suspected, using the EMC/MC Test Unit and following the test procedure.

The surface between the terminal posts of Transmitters with removable sensor leads needs to be periodically cleaned of any deposits to ensure accurate readings.

Deposits between the terminal posts can lead to elevated readings at the low end of the measuring range with detrimental effects on drying time and kiln energy consumption.

At the end of the Transmitter life span dispose of in accordance with all Federal, State and Local regulations.

INSTALLATION OF RECEIVERS IN THE KILN:

Mount one Receiver on one side of the lumber packs (front of kiln) and one on the other side (back of kiln). These are the best locations to make sure the signals of all Transmitters are being picked up. That is also the best location for temperature measurement since the temperature sensors are integrated in the Receivers.

Do not mount the Receivers in the corners of the kiln. This is a bad place for radio frequency reception. Make sure no metal objects (like baffles) are shielding the Receivers from the Transmitters in the kiln.

Front Receiver:

This Receiver can be mounted above the front door of the kiln, somewhere in the middle. Do not mount it above the level of the fan deck.

Mount the Receiver in such a way that the antenna is oriented vertically and not horizontally.

Make sure no water can drip onto the temperature sensor since this will offset the readings.

Back Receiver:

Mount this Receiver somewhere in the middle of the wall, in about the same elevation as the Transmitters are placed in the lumber. Do not mount the Receiver flat on the wall.

Instead, mount it on a small metal plate and mount this plate with a 90-degree angle to the wall.

The antenna is then oriented vertically and not horizontally.

A small rain shield must be mounted about 2ft - 3ft (0,7 - 1,0m) above the Receiver to protect the temperature sensor from water dripping onto it, since this will offset the readings.

REGULATORY INFORMATION:

FCC Compliance Statement:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the manufacturer's instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by monitoring reception with the equipment being active and inactive (see below), try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and the Receiver
- Connect the equipment into an outlet on a circuit different from that to which the Receiver is connected
- Consult your dealer or an experienced radio/TV technician for help

This equipment can be deactivated by powering down the Receiver Station and shorting out the sensor leads of the Transmitter (which will disable it).

Warning: Changes or modifications to the equipment that are not expressly approved by the manufacturer could void the user's authority to operate the equipment.

ERROR CODES FOR KILN CONTROL SOFTWARE		
CODE	ERROR DESCRIPTION	
M-1	No reply from kiln controller (communication failed or no power)	
	Kiln controller communication failure - can be caused by loss of power to the controller, controller communication port failure, communication cable damage or wiring problem, wrong kiln number set... See troubleshooting guide for steps to resolve this.	
M-2	Steam pressure out of range	
	No sensor present, sensor defective, pressure higher or lower than sensor specs.	
M-3	Steam conservation	
	Kiln is in steam conservation mode per steam table.	
M-4	Fatal error in schedule	
	Schedule is corrupt, wrong temperature units in schedule - try different schedule or edit current schedule and save again.	
M-5	Kiln controller halted process (both EMC and/or Temp's out of range)	
	Kiln shut down because of errors in both temperature values E6, E7 and/or both EMC values E4, E5, or negative drop across the load E49, or corrupt memory in controller E50, E55. This error will remain until kiln is restarted. See troubleshooting guide for steps to resolve this.	
M-6	Corrupted process parameter	
M-7	Steam flow out of range	
M-8	Kiln controller halted process – both Temp's out of range	
	Kiln shut down because of errors in both temperature values E6, E7. See troubleshooting guide for steps to resolve this.	
M-9	Kiln controller halted process – both EMC out of range	
	Kiln shut down because of errors in both EMC values E4, E5. See troubleshooting guide for steps to resolve this.	
E-0	unused	
E-1	unused	
E-2	No data received from master (MP8/MP16/Control PC)	LSA only
	Same as M1 error but shown on LSA only	
E-3	No data received from slave (PLC/LIO/External DAM)	
	Communication failed between KCM/PCM and PLC/LIO. See troubleshooting guide for steps to resolve this.	
E-4	EMC out of range - reading invalid, side A	Fans will not reverse or kiln will shut down if both E4 & E5 are shown.
	On wirebound systems - problem with PCM/DAM, damaged EMC cables, electrical noise picked up by EMC cables.	
E-5	EMC out of range - reading invalid, side B	Fans will not reverse or kiln will shut down if both E4 & E5 are shown.
	See E-04	

E-6	Temp out of range - reading invalid, side A, zone 1	Fans will not reverse or kiln will shut down if both E6 & E7 are shown.
	On wirebound systems - defective temperature probe or wiring problem, problem in PCM/DAM. On wireless systems - usually problem in the receiver cable and its splice, or defective receiver or defective kiln data port in controller.	
E-7	Temp out of range - reading invalid, side B, zone 1	Fans will not reverse or kiln will shut down if both E6 & E7
	See E-06	
E-8	Temp out of range - reading invalid, side A, zone 2	
	See E-06	
E-9	Temp out of range - reading invalid, side B, zone 2	
	See E-06	
E-10	Wet EMC sensor - above 25%, side A	
E-11	Wet EMC sensor - above 25%, side B	
E-12	unused	
E-13	unused	
E-14	unused	
E-15	Fans not running and they should be	Heat will be off.
	First check fan manual control if in off position. Fans are actually not running or fan status feedback from fan starters to controller is interrupted. If controller fan output is active, follow the control signal from controller to fan starters and back on feedback signal to find problem.	
E-16	Fans not off and they should be	
	First check fan manual control if in fwd/rev position. Check fan status feedback signal.	
E-17	Wrong fan direction	
	Check manual fan control. Fan control wiring reversed.	
E-18	Problem in frequency converter (VFD)	
	VFD has faulted - refer to VFD operating manual.	
E-19	unused	
E-20	unused	
E-21	unused	
E-22	unused	
E-23	unused	
E-24	Temperature variation too large	
	Active temp 10°C higher or lower than internal desired temperature - zone 1.	
E-25	EMC variation too large	
	Active EMC 3% higher or lower than internal desired EMC.	
E-26	Overtemperature condition reached	
	Active temperature has been 7°C or more over internal desired temperature for at least 15 minutes (zone 1 or 2).	
E-27	Temperature variation too large	
	Active temp 10°C higher or lower than internal desired temperature - zone 2.	
E-28	unused	
E-29	unused	

E-30	unused	
E-31	unused	
E-32	unused	
E-33	MC 1 out of range - reading invalid	
E-34	MC 2 out of range - reading invalid	
E-35	MC 3 out of range - reading invalid	
E-36	MC 4 out of range - reading invalid	
E-37	MC 5 out of range - reading invalid	
E-38	MC 6 out of range - reading invalid	
E-39	MC 7 out of range - reading invalid	
E-40	MC 8 out of range - reading invalid	
E-41	MC 9 out of range - reading invalid	
E-42	MC 10 out of range - reading invalid	
E-43	MC 11 out of range - reading invalid	
E-44	MC 12 out of range - reading invalid	
E-45	MC 13 out of range - reading invalid	
E-46	MC 14 out of range - reading invalid	
E-47	MC 15 out of range - reading invalid	
E-48	MC 16 out of range - reading invalid	
	On wireless systems - most often the transmitter is buried too deep in lumber pack and radio signal is not able to penetrate out of the lumber to reach receiver. If transmitter is several years old the battery is at the end of life span and transmitter needs to be replaced. These errors can be generated if MC values are changing too fast (more than 4% within 8 minutes). If all transmitters including EMC drop out then a receiver(s) could be defective or electrical noise is causing communication failures between receiver and controller. See troubleshooting guide for further instructions.	Kiln will shut down if all MC probes are out of range AND using moisture schedule DM.
E-49	Inactive temperature higher than active temperature	Kiln will shut down.
E-50	ROM bad on CPU board	Kiln will shut down.
	Resetting controller (cycling power or hard reset) should clear this error. If error is persistent the controller needs to be replaced.	
E-51	unused	
E-52	unused	
E-53	unused	
E-54	Error in power fail protected RAM	Kiln will shut down.
	Resetting controller (cycling power or hard reset) should clear this error. If error is persistent the controller needs to be replaced.	
E-55	RAM bad on CPU board	Kiln will shut down.
	Resetting controller (cycling power or hard reset) should clear this error. If error is persistent the controller needs to be replaced.	

"Out of range" means value shown is invalid because actual value is too low or too high or is changing too fast (more than 4% within 8 minutes).

TROUBLESHOOTING GUIDE FOR WIRELESS KILN CONTROL SYSTEMS

Normal operation - Description of LED indicating lights:

KCM/KCU Yellow and green LED From Main/To Main should be blinking every 30 seconds. This indicates communication with the MP16 (Control PC).

KCM/KCU Any red LED on the KCM or KCU module indicates a problem.

Receivers: Green LED should be blinking slowly in about 10 second interval. The LED will turn on when at least one moisture or EMC transmitter is picked up. Receiver sends data to the KCM/KCU about every 10 seconds. If transfer is successful green LED will be turned off and receiver will wait for the next signal from a transmitter. Cycle repeats.

Problems

When a problem occurs, first observe the control system and see what the system is telling you.

1. Report all **Error Messages** exactly as shown on the Host PC.
2. Report **status of indicator lights** on the KCM/KCU module and Receivers in the kiln.

Critical errors like both E4, E5 - EMC (wet bulb) sensor out of range or both E6, E7 - temperature (dry bulb) out of range will shut down the kiln drying process. Error M5 will be shown as a result of the shutdown and remain displayed until kiln is restarted again.

When troubleshooting the control system make only one change at a time and observe for any changes in operation. Continue with the next step until problem is resolved.

Hardware Troubleshooting

Troubleshooting control system by way of analyzing LED lights on the KCM/KCU and receivers				
LED location	Status	Problem	Action	
1	Kiln Data KCM/KCU	OFF steady	Communication between both receivers and KCM/KCU is okay	None required.
	E4, E5 E6, E7	ON steady	Communication failed between KCM/KCU and both receivers. One or both receivers are bad. One bad receiver could cause that the good receiver can not communicate with the KCM/KCU.	Disconnect one of the receivers and check Kiln Data LED. If light is steady on then the receiver connected has a communication problem. If light is now blinking the receiver connected is able to communicate with the KCM/KCU. Repeat this with the other receiver.
		Blinking	Communication failed on one of the receivers. The problem could be in the receiver itself or in the wiring. Cables and especially cable splices can fail after time when exposed to kiln conditions.	Check each receiver. If the green LED on the receiver is blinking it indicates normal operation. If the green LED on the receiver is steady off or steady on it indicates a problem. See Receiver LED problems for detailed actions required.
		NOTE:		Majority of the problems with receivers is related to poor receiver cable splice. Cut off existing cable splice and make new one. Use the the same receivers first and connect one receiver at the time. Check operation before sealing the splice.

	LED location	Status	Problem	Action
2	Control I/O KCM only	OFF steady	Communication between KCM and PLC is okay	None required.
	E-3	ON steady (1)	Communication between KCM and PLC failed. Problem could be caused by damaged Control I/O port in the KCM (1) or damaged RS485 port in the PLC (2).	If AUX Data LED is steady OFF then Control I/O port on the KCM is most likely bad. Swap the KCM with another kiln without problems to confirm this. If the problem follows the KCM module it means the KCM is bad.
		ON steady (2)		If AUX Data LED is also steady ON then communication port in the PLC is most likely bad. Swap the PLC with another kiln without problems to confirm that. If the problem follows the PLC it means the PLC is bad.
		ON steady or intermittent	Communication cable between KCM and PLC damaged or loose connection.	Inspect the communication cable between KCM and PLC. Check for physical damage and that both ends are properly and securely terminated.
	LED location	Status	Problem	Action
3	Main Data KCM/KCU	OFF steady	Communication between KCM and MP16 (or Control PC) is okay.	None required.
	M-1	ON steady	Communication between KCM/KCU and MP16 failed. Problem could be caused by damaged Main port in the KCM/KCU or problem with MP16 or cable between KCM/KCU and MP16.	Is the MP16 running? MP16 has one LED on board and it should be blinking when program is running. If no LED activity see MP16 problems for actions required.
		NOTE:	It takes one minute before the Main Data LED turns on after communication has failed.	Check cables between KCM/KCU and MP16.
				Swap the KCM/KCM with another kiln without problems. Kiln number must be changed if the KCM/KCU is to remain at this location. If problem follows the KCM/KCU it indicates problem with KCM/KCU. If problem stays with the kiln it indicates connection problem. Check cables between KCM/KCU and MP16 and connectors.

	LED location	Status	Problem	Action
4	From Main To Main	short blinks every 30 seconds	Communication between KCM and MP16 (or Control PC) is okay.	None required.
		Green LED (From Main) steady on	Wiring problem on Main Data bus or controller communication driver failure.	If this is the initial installation then check wiring - connections between MP16 and all kiln controllers. Refer to installation documentation for proper cable terminations.
				If this problem occurs at a later time after controller has been in operation for some time and no wiring changes have been done then the problem is most likely in bad communication driver in the kiln controller or MP16. This could be caused by lightning strike in the vicinity or power surge on power line. Short in the cable could also be the cause.
				Disconnect all controllers and reconnect one at a time. You should be able to find the bad one with this procedure. If you can not then the MP16 is most likely bad.
	LED location	Status	Problem	Action
5	Receiver LED	Blinking	Normal operation. Receiver picks up transmitter signals and sends data to the KCM/KCU.	None required.
		OFF steady (1)	No RF signal from transmitters. This means no working transmitters within range or transmitters out of range.	Check that you have at least one working transmitter in the vicinity of the receiver.
		OFF steady (2)	No power to the receiver due to the blown fuse inside the KCM/KCU.	Check if any LED's on the KCM/KCU are working. If all are OFF and error M1 is shown then the fuse in the KCM/KCU is blown. Replace with 0.3A slow blow fuse.
		OFF steady (3)	No power to the receiver due to damaged cable between KCM/KCU and receiver or bad receiver.	If the LED on the other receiver is working then inspect the cable between KCM/KCU Kiln Data port and suspected receiver. Pay special attention to the cable splice. You may want to open the splice to inspect and measure the voltage. There should be around 24VDC between red and black wire and 0.26VDC - 0.30VDC between white and green (blue) wire.
		ON steady	Communication between the receiver and KCM/KCU failed. This symptom should be accompanied by a steady or blinking Kiln Data LED on the KCM/KCU. Problem could be caused by damaged Kiln Data port in the KCM/KCU or damaged cable between KCM/KCU and receiver or bad receiver.	Swap the KCM/KCU with another one from a kiln without problems. Kiln number must be changed if the KCM/KCU is to remain at this location. If problem follows the KCM/KCU it indicates problem with KCM/KCU. If problem stays with the kiln it indicates connection problem. Check cables between KCM/KCU and receiver as described previously. If all the above steps do not yield any results then the receiver is bad and it should be replaced.

Serial number assignment list							
Kiln		Kiln		Kiln		Kiln	
EMC A		EMC A		EMC A		EMC A	
EMC B		EMC B		EMC B		EMC B	
MC1		MC1		MC1		MC1	
MC2		MC2		MC2		MC2	
MC3		MC3		MC3		MC3	
MC4		MC4		MC4		MC4	
MC5		MC5		MC5		MC5	
MC6		MC6		MC6		MC6	
MC7		MC7		MC7		MC7	
MC8		MC8		MC8		MC8	
RX1TE(B)		RX1TE(B)		RX1TE(B)		RX1TE(B)	
RX1TO(A)		RX1TO(A)		RX1TO(A)		RX1TO(A)	
Kiln		Kiln		Kiln		Kiln	
EMC A		EMC A		EMC A		EMC A	
EMC B		EMC B		EMC B		EMC B	
MC1		MC1		MC1		MC1	
MC2		MC2		MC2		MC2	
MC3		MC3		MC3		MC3	
MC4		MC4		MC4		MC4	
MC5		MC5		MC5		MC5	
MC6		MC6		MC6		MC6	
MC7		MC7		MC7		MC7	
MC8		MC8		MC8		MC8	
RX1TE(B)		RX1TE(B)		RX1TE(B)		RX1TE(B)	
RX1TO(A)		RX1TO(A)		RX1TO(A)		RX1TO(A)	

Notes