LUDLUM MODEL 3030P
ALPHA-BETA SAMPLE COUNTER

July 2024

Serial Number 251450 and Succeeding Serial Numbers

Software Version 1.7.0 and Succeeding Versions

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LUDLUM MEASUREMENTS, INC.
501 OAK STREET, P.O. BOX 810
SWEETWATER, TEXAS 79556
(800) 622-0828 (USA & CANADA)
325-235-5494 FAX: 325-235-4672

STATEMENT OF WARRANTY

Ludlum Measurements, Inc. warrants the products covered in this manual to be free of defects due to workmanship, material, and design for a period of twelve months from the date of delivery. The calibration of a product is warranted to be within its specified accuracy limits at the time of shipment. In the event of instrument failure, notify Ludlum Measurements to determine if repair, recalibration, or replacement is required.

This warranty excludes the replacement of photomultiplier tubes, G-M and proportional tubes, and scintillation crystals which are broken due to excessive physical abuse or used for purposes other than intended.

There are no warranties, express or implied, including without limitation any implied warranty of merchantability or fitness, which extend beyond the description of the face there of. If the product does not perform as warranted herein, purchaser's sole remedy shall be repair or replacement, at the option of Ludlum Measurements. In no event will Ludlum Measurements be liable for damages, lost revenue, lost wages, or any other incidental or consequential damages, arising from the purchase, use, or inability to use product.

RETURN OF GOODS TO MANUFACTURER

If equipment needs to be returned to Ludlum Measurements, Inc. for repair or calibration, please send to the address below. All shipments should include documentation containing return shipping address, customer name, telephone number, description of service requested, and all other necessary information. Your cooperation will expedite the return of your equipment.

LUDLUM MEASUREMENTS, INC.
ATTN: REPAIR DEPARTMENT
501 OAK STREET
SWEETWATER, TX 79556

800-622-0828 325-235-5494
FAX 325-235-4672

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Section 1

Introduction

The Model 3030P is a dual-channel counter designed for simultaneous alpha and beta sample measurement. The Model 3030P has a built-in, solid-state detector with a sample tray that can accept a maximum sample size of 5.1 cm (2 in.) diameter and up to 0.64 cm (0.25 in.) depth.

The Model 3030P is powered by a universal input wall-mount power supply, or may be powered from four "D" cell batteries. The instrument features a built-in detector power supply, adjustable count time periods, and click-per-event audio with adjustable volume. A pulse height analyzer is employed to provide information to the two independent counters. The two independent LCDs (liquid crystal displays) feature six 1.3 cm (half-inch) tall digits; backlit for improved visibility.

The instrument may be operated as a traditional scaler (counts per count time), or may be enabled to operate with advanced features. The USB type-B connector on the back of the instrument allows attachment to a computer. Software is provided to allow the setup of parameters or advanced features. A computer is NOT necessary for normal operation of the unit.

The counts per minute (CPM) or disintegrations per minute (DPM) modes may be enabled to allow the count to be converted (automatically in real-time) to counts per minute or disintegrations per minute. The background radiation count may be subtracted automatically in either mode. Crosstalk correction, alpha or beta alarms, and time/date may also be set. Parameters are stored in non-volatile memory. Time and date are maintained with an internal lithium battery.

Another advanced feature, which may be enabled or disabled, is the QC (Quality Control) check function. When enabled, the user must perform measurements on known sources (and/or background alone) and receive acceptable numbers for the instrument to be used that day. Twenty-four hours later, the QC LED (light emitting diode) is turned on, indicating the need for another QC check. This feature ensures that the instrument is tested at least

daily and helps ensure that the measurements are valid. Its also possible to disable the automatic QC and perform the QC check manually.

Some rudimentary alpha spectroscopy may also be done with the included interface software. Data may be generated on a channel-by-channel basis, and saved to a .csv file for subsequent plotting. Some amount of radon reduction (typically about 75%) is achieved through the setting of an alpha upper threshold.

An optional internal shielding kit is available to reduce the beta background, especially in area of elevated radiation levels. This kit may be installed after purchase and increases the weight by approximately 4.5 kg (10 lb.).

Notice!

The detector is sensitive to microphonics. Vibration or shock to the instrument during counting could produce noise or false counting. Avoid touching the tray while counting, and place the instrument on a stable surface.

Caution!

The Model 3030P is sensitive to excessive shock, which can cause permanent damage to the detector. This can happen if the instrument is dropped or if it's not protected during shipping. The effect of the damage will most likely be noise in the beta channel. When shipping the instrument, please pack appropriately.

Section 2

Getting Started

Unpacking and Repacking

Remove the calibration certificate and place it in a secure location. Remove the instrument and accessories (batteries, cable, etc.) and ensure that all of the items listed on the packing list are in the carton. Check individual item serial numbers and ensure calibration certificates match. The Model 3030P serial number is located centered on the bottom of the back panel.

To return an instrument for repair or calibration, provide sufficient packing material to prevent damage during shipment and ensure that any planchets are removed from the sample counting tray and the sample holder/carrier is either removed or secured with the set-screw provided. The aluminum sample carrier in the sample drawer is secured in place for shipment using a small set-screw, which can be removed using a 1/16 inch Allen wrench. It is suggested that after the screw is removed, that the screw is re-secured in place with a small amount of Loctite® thread locker, either using the Thread locker SR Type 222 Purple®, or 222MS® (MIL-SPEC) MIL-S-46163A for existing designs. ASTM D-5363**, NSF™ P1, CFIA (or equivalent).

Every returned instrument must be accompanied by an Instrument Return Form, which can be downloaded from the Ludlum website at www.ludlums.com. Find the form by clicking the "Support" tab and selecting "Repair and Calibration" from the drop-down menu. Then choose the appropriate Repair and Calibration division where you will find a link to the form.

Software Installation

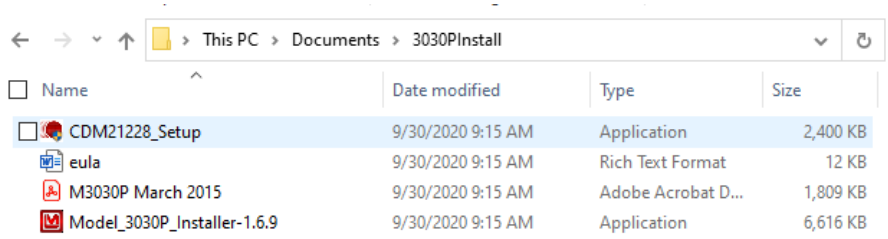
Interface software supplied with the instrument will need to be installed if access to advanced features is desired. User must comply with the software license agreement found in Section 7 of this manual.

Install the Model 3030P interface software before making any connections between the instrument and a computer.

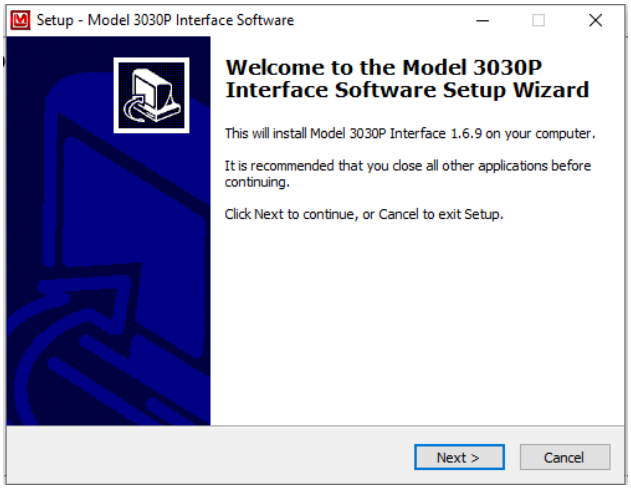
Note:

Uninstall any previous version of the Model 3030P interface software prior to installing this version.

Insert the software media into the computer (it may be a CD or a USB thumb drive). The software will automatically install. If desired, double-click "setup.exe" to manually install the software. If the software is to be installed on a computer/laptop without a CD drive, software is available by calling the Ludlum Measurements Sales Department. Navigate to the directory where the software has been downloaded and extracted to and double-click on the Model_3030P_Installer-X.X.X version of the installer software.

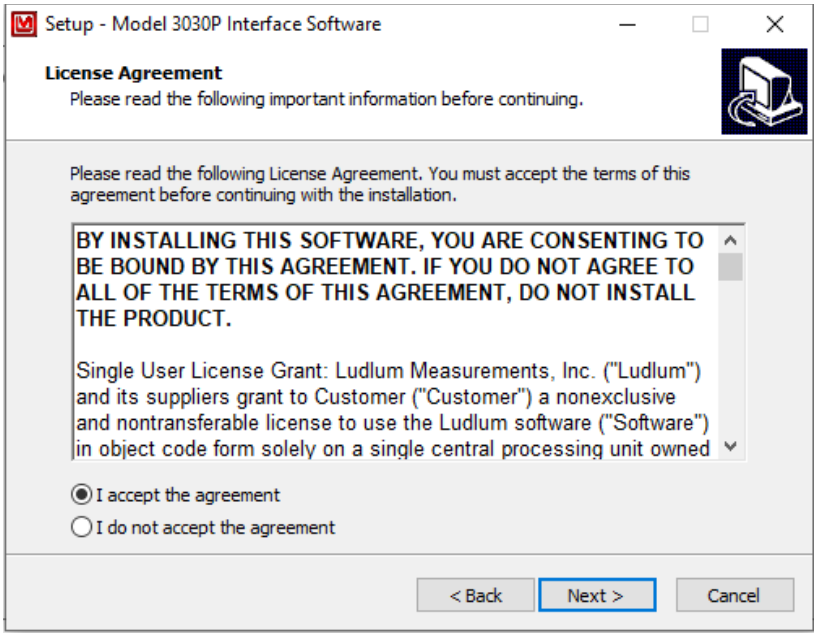


After the automatic installation program begins, follow the prompts as follows:

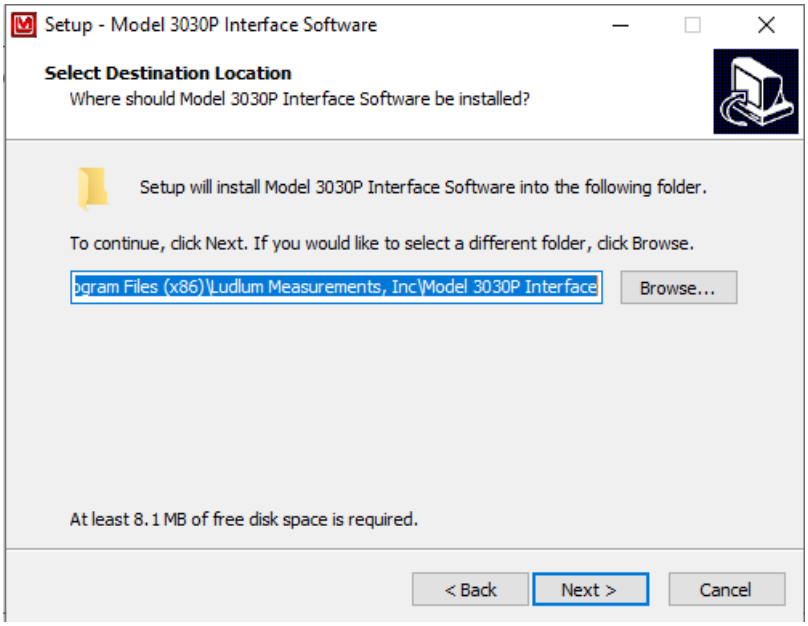


Select Next:

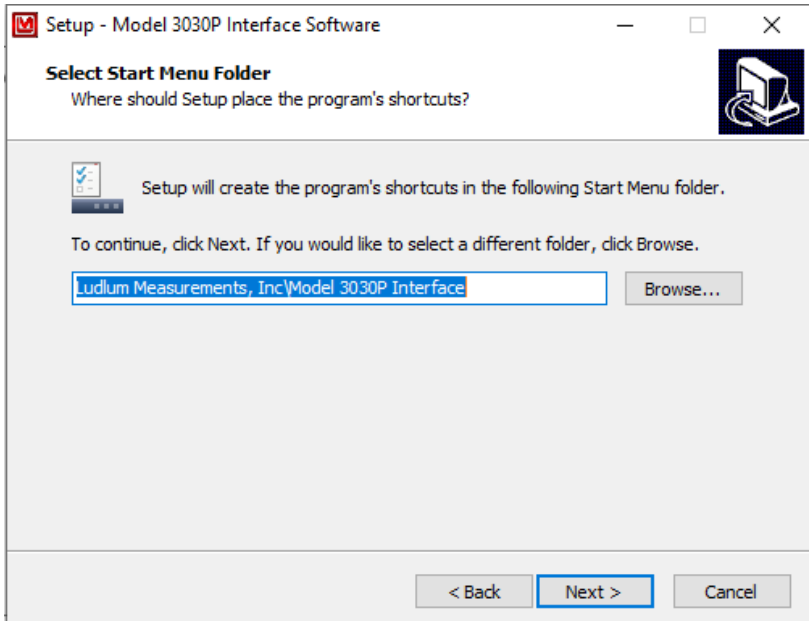
Agree to the license terms:



Select Next:

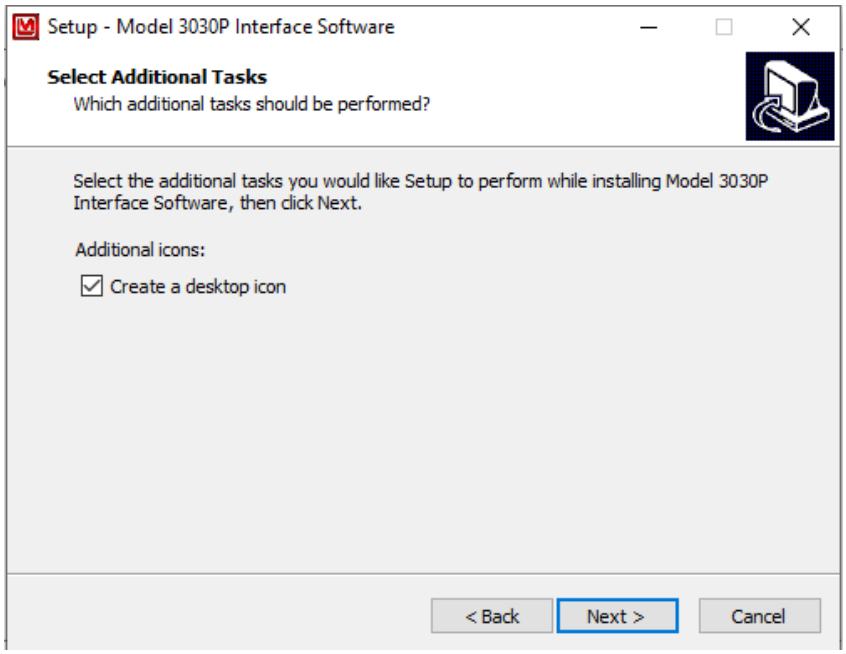


Note the install directory and select Next:

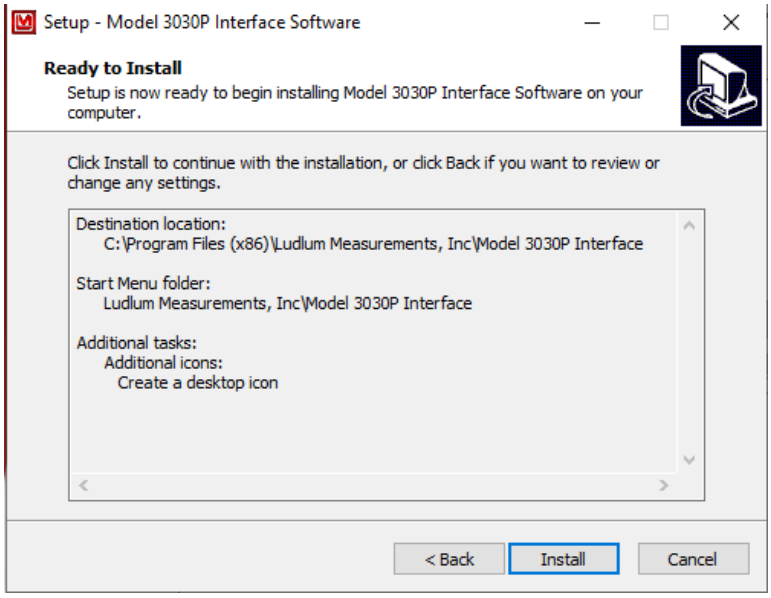


Take note of the directory to which the executable file is saved. After completion of the installation, the program may be accessed through the directory in which it was saved and/or the program start menu/shortcut.

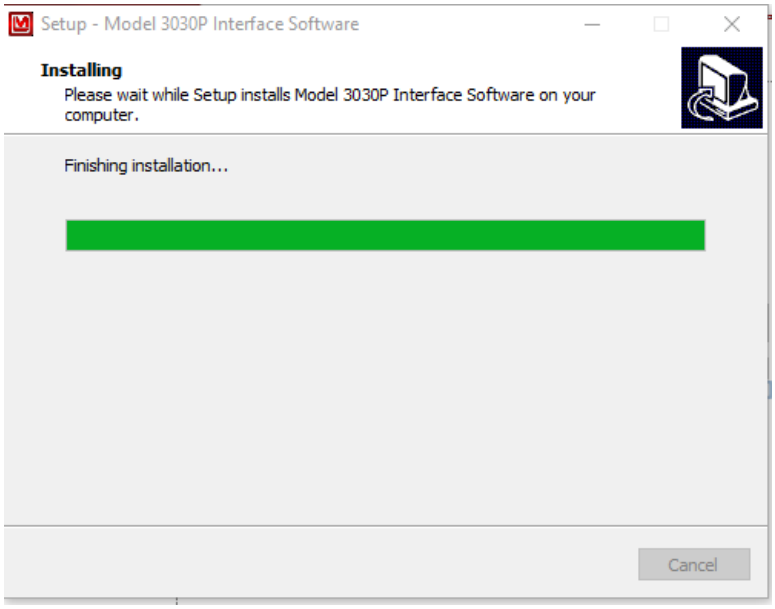
Select the Start Menu folder and select Next:



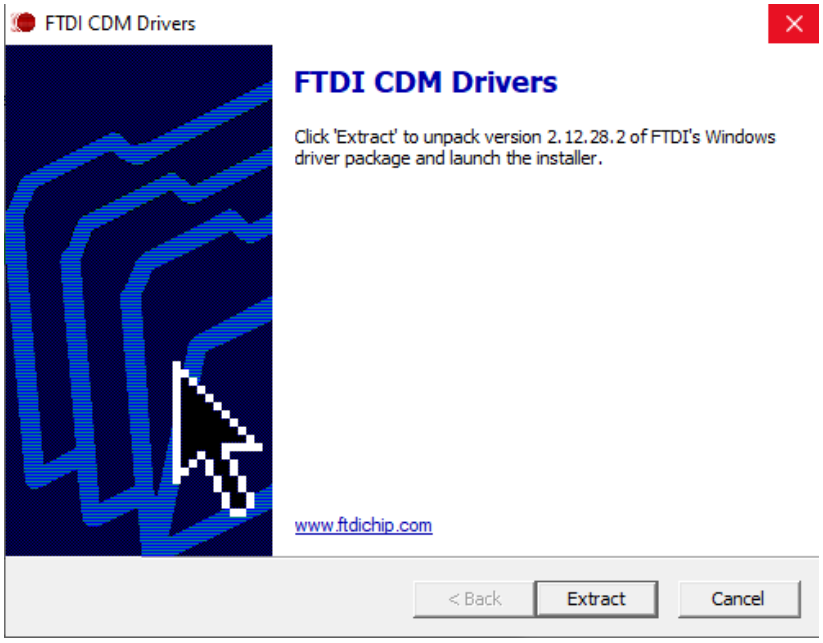
Select Next:



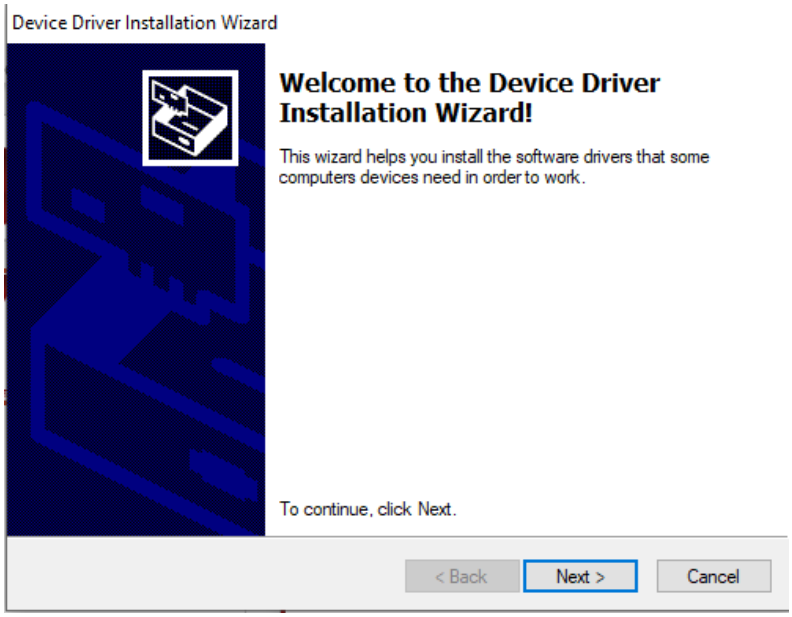
Select Next:



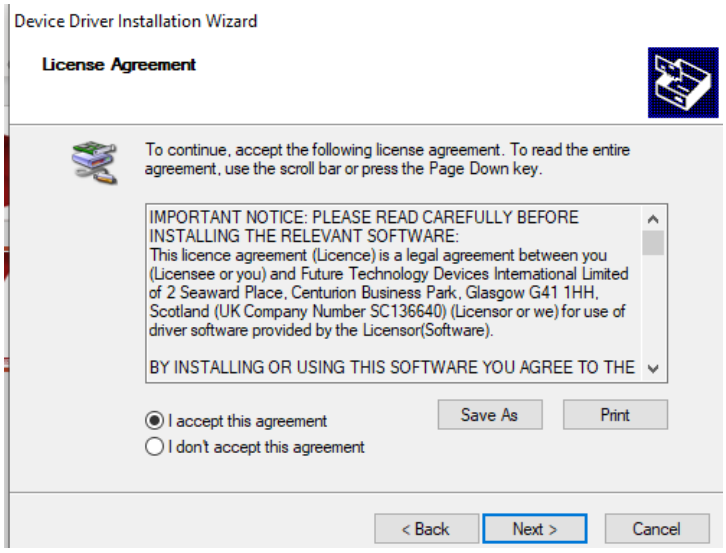
The software will complete installation. After the installation is complete, the FTFI CDM Drivers will be installed and the following install dialog will appear:



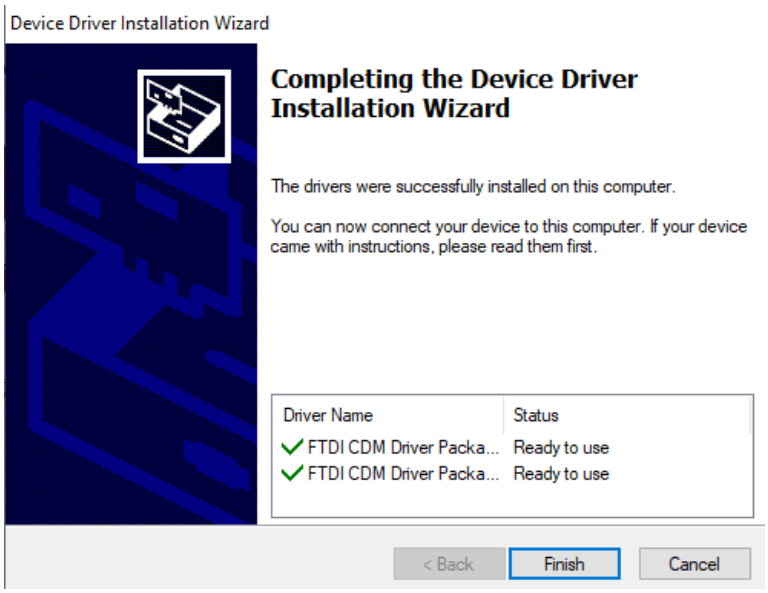
Select Extract:



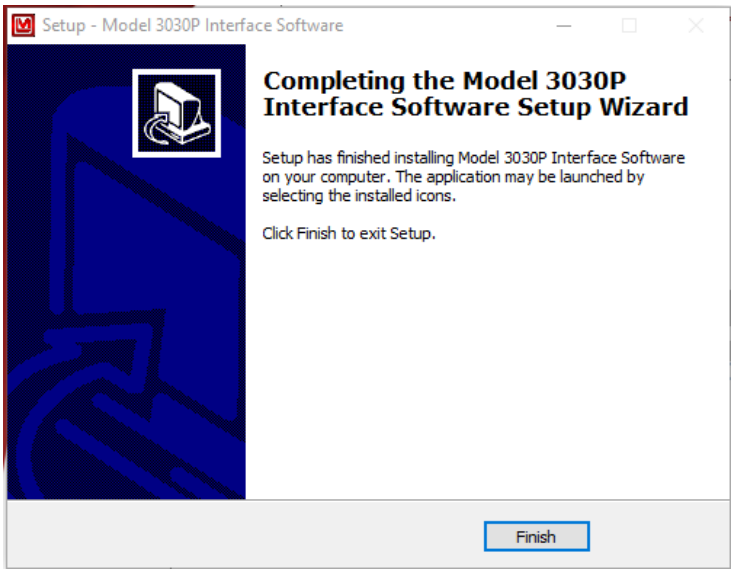
Select Next:



Accept the license agreement and select Next:



Select Finish.



Select Finish to complete the software setup.

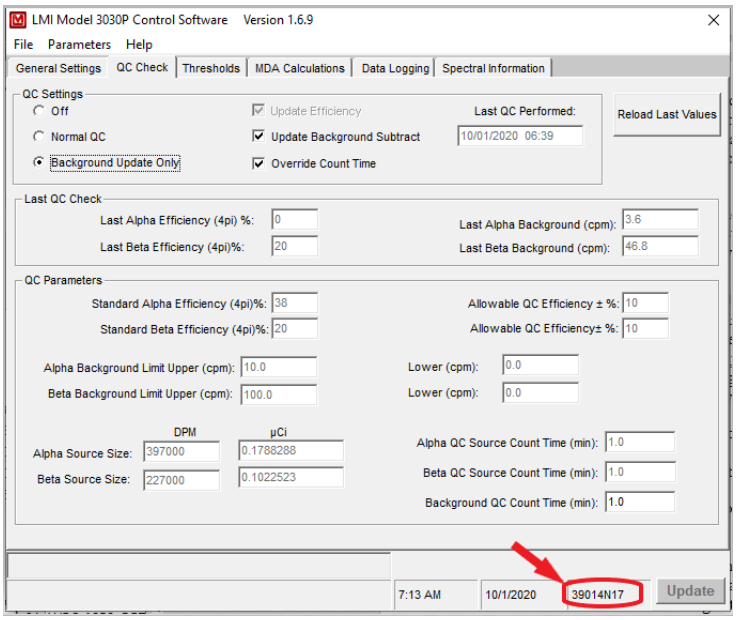
Start-up

Before using the instrument for the very first time, determine whether or not a computer interface is desired. If the computer interface is desired, please return to the previous subsection, "Software Installation," before continuing, and then connect the instrument to the computer using the USB cable provided.

Connect the instrument to mains power using the power cable provided, and then turn the instrument on "|" using the back-panel power switch (upper left corner).

Upon power-up, the LCD displays become backlit, the front-panel indicators (LED's) illuminate, and the alpha and beta displays show all eights (888888). Next, the firmware version is displayed in the alpha display. Instrument parameters will display before initialization completes if the "Show Parameters during Power-Up" box is checked in the "General Settings" tab within the interface program. After initialization is complete, both displays are blanked and all front-panel indicators (LEDs) are turned off.

The firmware version is also displayed in the lower right corner of the computer interface screen as seen in the following figure:



If using the computer interface, start the interface program from the appropriate directory/shortcut and set the desired operating parameters described in detail in Section 6 of this manual. Also, if desired, perform a QC check. See Section 6 of this manual for further details on QC check.

The COUNT TIME MINUTES switch should be set based on the count rates being observed and the desired statistical sensitivity and performance. Set the VOLUME control to the desired level of audio.

Proceed to use the instrument. For further information on instrument controls or functions, consult Sections 4 and 7 of this manual.

Section 3

Specifications

Alpha Efficiency* (4π geometry): 35% for ^{239}Pu; 30% for ^{241}Am

Beta Efficiency* (4π geometry): 15% for ^{99}Tc; 23% for ^{137}Cs; 36% for ^{90}Sr/^{90}Y

Channel Thresholds: two upper and lower thresholds, which define the beta and alpha regions. Each threshold may be set from 0 to 5000 mV. Default settings are:

Beta Threshold = 75 mV

Beta Window = 700 mV

Alpha Threshold = 1000 mV

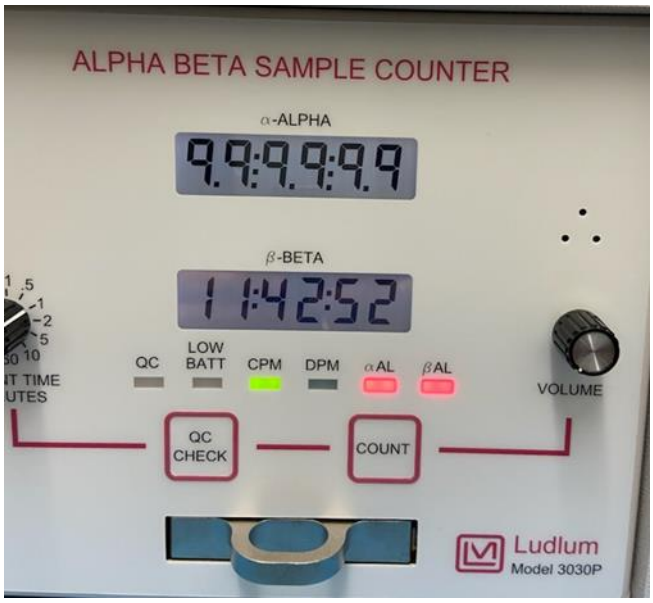
Alpha Window = 4000 mV

Status Indicators: Backlit indicators for QC-daily QC check needed; LOW BATT MEANS battery voltage is low; CPM/DPM means counting in CPM or DPM mode; αAL/βAL means count has exceeded the alarm set point.

When the Model 3030P is counting, there will be colons present on the display, as shown in the top right photo.

The display also has a "rollover" indication showing that the counts have exceeded the display capability (seen in the bottom right photo). When this occurs, the display (alpha or beta) that rolls over will display decimal points between each digit. It will also light both alpha and beta alarm lights if they are not already on. At the end of the count time, the final result will show the net reading, less 999999.

A 99:99:99 display with decimals between each "9" means that the instrument has exceeded its count/count rate capacity and is currently taking a count (shown below).



Warning!

It is possible for very high activity samples to have multiple rollovers, and in such cases, the displayed measurement results could be wrong.

Warning!

If in cpm/dpm (count = averaged rate) the value goes over 999999 but falls back under 999999 by the end of the count, the decimal points will also be displayed, both when 999999 is exceeded and when the count time is complete.

Count Time: Select 0.1, 0.5, 1, 2, 5, 10, or 60 minutes, or the user-defined PC setting, which is defined during setup using the USB port. User-defined count time may be set from 0.1 to 1666.6 minutes.

Scalers: two each (one per channel), six-digit LCD displays with backlights providing a range of 0-999999 counts (started by the COUNT button)

Scaler Linearity: reading within 2% of true value

Data Output: type "B" USB port

Detector: solid-state silicon detector

Detector Window: made up of approximately 0.6 um aluminum and 0.6 um varnish, approximately 1.2 to 1.5 um total

Active and Open Area: 1700 mm^2

Sample Tray: capable of holding 2.5 cm (1 in.) or 5.1 cm (2 in.) diameter samples (with provided aluminum insert/carrier), up to 1.02 cm (0.4 in.) thick.

Audio: dual tone (one for each channel) click-per-event type with volume control

Power universal AC input (95-250 Vac, 50-60 Hz) wall-mount supply outputting 5 Vdc at up to 1 amp, or 4 each "D" cell batteries provide power for 48 hours

Size: 19 x 20.3 x 25.4 cm (7.5 x 8 x 10 in.) (H x W x D), including handle in height and drawer handle in depth

Weight: approximately 3.9 kg (8.5 lb), or approximately 8.4 kg (18.5 lb) with the optional detector shielding

Finish: aluminum housing with powder coat finish, subsurface printed front panel

Section 4

Description of Controls and Functions

Front Panel

COUNT Button: resets and starts the counting cycle. This switch will also reset the two counters when depressed.

QC CHECK Button: starts the QC (Quality Control) check cycle. This switch will also reset the two counters when depressed.

COUNT TIME (MINUTES): a rotary switch, allowing selection of count times of 0.1, 0.5, 1, 2, 5, 10, 60 or a PC position that selects the user-defined count time

VOLUME: a rotary control used to vary the audio output from off to full volume

Tray: A slide-out tray is used to hold the sample during a count cycle. The tray will hold samples that are up to 1.02 cm (0.4 in.) thick by either 2.5 cm (1 in.) or 5.1 cm (2 in.) in diameter. The tray insert is held in place by a set screw (right side) and is reversible (by loosening the set screw) for selection of sample diameter.

ALPHA: A six-digit backlit LCD readout indicates counts received in the alpha counting channel.

BETA: A six-digit backlit LCD readout indicates counts received in the beta counting channel.

QC: A red LED indicator illuminates whenever QC is needed. When a valid QC check is performed, the QC indicator turns off. Additionally, the QC indicator is turned off when the QC check feature is disabled (during setup).

LOW BATT: A red LED indicator illuminates whenever the instrument is operating on batteries and the battery voltage is low.

CPM: A green LED indicator illuminates whenever CPM mode is established (during setup).

DPM: A green LED indicator illuminates whenever DPM mode is established (during setup).

αAL: A red LED indicator illuminates whenever the alpha count exceeds the alarm level established during setup.

βAL: A red LED indicator illuminates whenever the beta count exceeds the alarm level established during setup.

Back Panel

ON/OFF: a rocker switch used to apply power to the instrument when in the ON position

USB: a type-B connector for connection to a computer

Power Input Jack: 5.0 Vdc, 5W

2 Battery Tubes: Each tube holds 2 "D" cell batteries.

Internal Controls

The following dipswitches and jumpers are located on the amplifier/processor board and are only accessible when the cover is removed:

Dipswitch 1: When in the OFF position, the Model 3030P is locked into scaler mode only. The default position is ON.

Dipswitch 2: When in the OFF position, the calibration date is enabled. The default position is ON.

Section 5

Safety Considerations

Environmental Conditions for Normal Use

- Indoor use only
- No maximum altitude
- Temperature range of -20 to 50°C (-4 to 122°F)
- Maximum relative humidity of less than 95% (non-condensing)
- Mains supply voltage range of 95-250 Vac, 50/60Hz single phase, max 250 Vac, or four each "D" cell batteries
- Maximum transient voltage of 1500 Vac
- Installation Category II (Overvoltage Category as defined by IEC 1010-1)
- Pollution Degree 3 (as defined by IEC 664) (Occurs when conductive pollution or dry nonconductive pollution becomes conductive due to condensation. This is typical of industrial or construction sites.)

Cleaning Instructions and Precautions

The Model 3030P Alpha-Beta Sample Counter may be cleaned externally with a damp cloth, using only water as the wetting agent. Do not immerse the instrument in any liquid. Observe the following precautions when cleaning:

1. Turn the instrument OFF and disconnect the instrument power cord.
2. Allow the instrument to sit for one minute before cleaning.

Warning Markings and Symbols

Caution!

The operator or responsible body is cautioned that the protection provided by the equipment may be impaired if the equipment is used in a manner not specified by Ludlum Measurements, Inc.

Caution!

The Model 3030P is sensitive to excessive shock, which can cause permanent damage to the detector. This can happen if the instrument is dropped or if it's not protected during shipping. The effect of the damage will most likely be noise in the beta channel. When shipping the instrument, please pack appropriately.

Caution!

Verify instrument voltage input rating before connecting to a power converter. If the wrong power converter is used, the instrument and/or power converter could be damaged.

The Model 3030P Alpha-Beta Sample Counter is marked with the following symbols:

⎓ **DIRECT CURRENT (DC)** (IEC 417, No. 5032) - designates an input receptacle that accommodates a power cord intended for connection to DC voltages. This symbol appears on the back panel.

CAUTION (per ISO 3864, No. B.3.1) – designates hazardous live voltage and risk of electric shock. During normal use, internal components are hazardous live. This instrument must be isolated or disconnected from the hazardous live voltage before accessing the internal components. This symbol appears on the back panel. **Note the following precautions.**

Warning!

The operator is strongly cautioned to take the following precautions to avoid contact with internal hazardous live parts that are accessible using a tool:

1. Turn the instrument power OFF and disconnect the power cord.

2. Allow the instrument to sit for one minute before accessing internal components.

The "**crossed-out wheelie bin**" symbol notifies the consumer that the product is not to be mixed with unsorted municipal waste when discarding; each material must be separated. The symbol is placed on the center of the instrument rear panel. See section 8, "Recycling," for further information.

Electrical Safety Precautions

Warning!

Observe the following instructions to avoid a potentially hazardous situation which, if mishandled, could result in death or serious personal injury, as well as property damage.

- Do not expose the unit to rain or an environment where it may be splashed by water or other liquids, as doing so may result in fire or electric shock.

- Use the unit only with the voltage specified on the unit. Using a voltage higher than that which is specified may result in fire or electric shock.

- Do not cut, kink, or otherwise damage nor modify the power supply cord. IN addition, avoid using the power cord in close proximity to heaters, and never place heavy objects – including the unit itself – on the power cord, as doing so may result in fire or electric shock.

- Avoid installing or mounting the unit or its power supply in unstable conditions, such as a rickety table or a slanted surface. Doing so may result in the unit falling down and causing personal injury and/or property damage.

Section 6

Calibration and Maintenance

Calibration

The following calibration procedure is applicable to the Model 3030P. Calibrated sources are required.

Recommended Sources

The recommended sources for use with the Model 3030P are plated ^{239}Pu alpha and ^{99}Tc beta sources. These sources have an active diameter of 3.2 cm (1.3 in.) with an overall diameter of 4.8 cm (1.9 in.). The larger diameter ring gives protection to the source from direct contact as the source is handled. Direct contact, i.e. touching, is a problem as oils from the skin can attenuate or block alpha and beta particles. The recommended activity is approximately 200,000 dpm. Sources used for calibration should mimic the geometry of, and radionuclides present on the sample to be counted. If you are counting 47 mm filters, or 2-inch smear samples, the calibration sources should be as close to these geometries as possible. If you want to count for 60 seconds, then a source activity of about 20,000 dpm will generally result in counts (given a nominal 4π efficiency) of 3000 counts. Counting this activity source in a tenth of a minute will result in a count of only about 300 above background, and your percentage error will be greater. Increasing the activity of the source to 200,000 dpm gives you better statistics, while allowing you to keep the count time short. Sources used for calibration need to be NIST traceable.

Calibration Procedure

- Perform mechanical checks, such as switch function and illumination of digital readouts.

- Connect the Model 3030P to the computer and load the default settings. Ensure that both dipswitches, located on the main board, are in the ON position.

- Insert a beta source: pulses in the beta channel should be audible. Ensure that the VOLUME control works correctly. Repeat this step with the alpha source.

- The objective of the next steps is to find the detector's efficiency while not over-counting the background radiation field. The 4π efficiency (Eff) is calculated as:

$$\frac{Instrument\ Count\ Rate}{dpm\ of\ Source} \times 100\% = Eff$$

In addition, crosstalk must be considered for determining the optimum operating voltage and is defined as:

$$\frac{\alpha\text{SourceC}\beta\text{-BackC}\beta}{\alpha\text{NetC}\alpha} \times 100\% = Alpha\ crosstalk$$

and

$$\frac{\beta SourceC\alpha - BackC\alpha}{\beta NetC\beta} \times 100\% = Beta\ crosstalk$$

where
αSourceCβ = α source count in β channel
BackCβ = background count in β channel
αNetCα = Net α source count in α channel
βSourceCα =β source count in α channel
BackCα = background count in α channel
βNetCβ = Net β source count in β channel

- For the alpha/beta PIPS™ detector in the 3030P, achievable 4π efficiencies are approximately:

15% for ^{99}Tc

36% for ^{90}Sr/Y

23% for ^{137}Cs

35% for ^{239}Pu

30% for ^{241}Am

- Acceptable background count rates (in a 10μR/hr field) are:

  alpha: 3 counts or less in 10 minutes (0.3 cpm)

  beta: approximately 350 counts in 10 minutes (35 cpm)

- Acceptable crosstalk values (in a 10μR/hr field) are:

  alpha crosstalk: 5% or less

  beta crosstalk: 0.1% or less

- Find the optimum thresholds and windows that give the greatest alpha and beta source efficiencies and acceptable background (cpm), while maintaining acceptable values for crosstalk between channels. The default settings, which reflect compromises between backgrounds, efficiencies, and crosstalk, may not be appropriate for all customers.

- Select the Print Parameters option from the interface software in order to save a copy of the parameters, efficiencies, and backgrounds.

Maintenance

Instrument maintenance consists of keeping the instrument clean and periodically checking the batteries and calibration.

An instrument QC check may be performed prior to each use by exposing the detector to a known source and confirming the proper reading.

Recalibration should be accomplished after any maintenance or adjustment has been performed on the instrument. Ludlum Measurements recommends recalibration at intervals no greater than one year. Local regulations may have precedence over this recommendation.

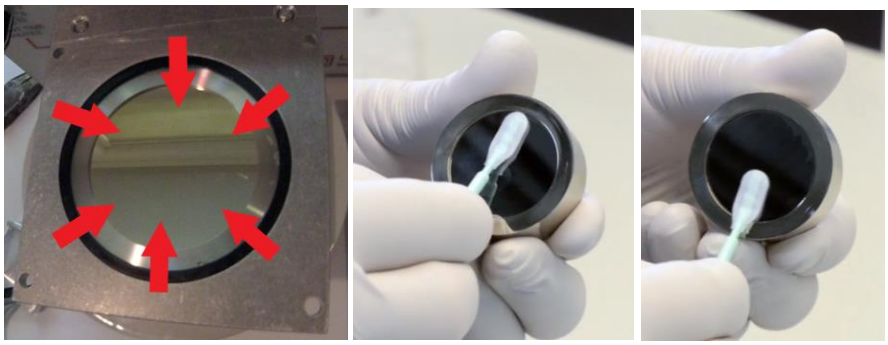
Cleaning a PIPS™ Detector

Warning!

PIPS™ detectors should NEVER be cleaned using Acetone. Acetone can degrade the conductive rubber and rubber constituents that are deposited on the sensitive edges of the detector inside the housing of the detector.

A PIPS™ detector can be cleaned to remove radioactive contamination in the form of dust/dirt, oil, oil films, fingerprints, or dust particles on the surface.

Recoil nuclei contamination can be removed to some extent by cleaning as well, but recoil nuclei can become embedded in the varnish surface and cannot be completely removed by cleaning. To clean a PIPS™ detector, the detector should first be blown off using canned dry air, Nitrogen or Argon gas, to remove particulates from the detector surface that might scratch the detector surface during the next cleaning steps. Use swabs (Texwipe® model TX762 or equivalent) moistened with Propanol-2. Be careful to not over-moisten the swabs. Wipe very gently from the edge of the detector to the center to reduce the possibility of pushing contaminated materials into the bevel of the housing where it is very difficult to remove. See photos below:



Repeat the cleaning treatment with fresh swabs, as needed, to eliminate traces of contamination. Blow dry with dry air, Ar or N_2 gas, across the detector surface. If possible, put under vacuum for 15 minutes or heat to 50 °C (122 °F) for an hour to remove residual moisture before installing the detector and applying bias.

A cleaning instruction video can be viewed at the following locations:

https://vimeo.com/220997203
https://www.youtube.com/watch?v=y7utmr-fEd0

If offline viewing is required, it is possible to download and save a copy for non-commercial purposes.

Note:

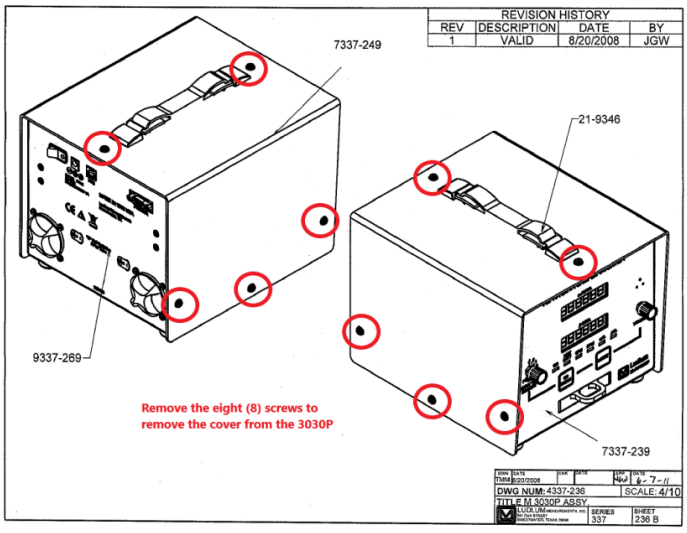
Cleaning is generally not effective in curing problems of leakage current, radiation damage, or excess (condensing) water vapor. Neither will it repair physical damage to the junction(s) or scratched windows. Suspect detectors should be checked carefully for physical damage to the surface(s) before other actions are taken.

To clean the PIPS™ detector, it must be first removed from the 3030P detector assembly. If the detector only needs inspection and possible cleaning, this may be done without removing the entire shielding/cylindrical mounting assembly from the chassis.

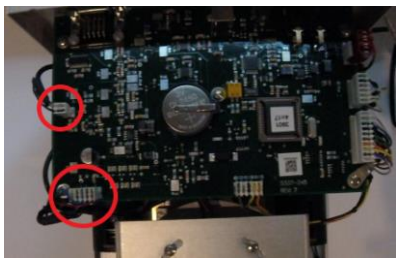
The suggested primary method to get access to clean and/or replace the PIPS™ detector is as follows:

The system should be unplugged and turned off. The unit should remain powered down for approximately 5 minutes before removing the cover.

Using a flat blade screwdriver, unscrew and remove the eight screws, three from each side of the unit and two from the top as shown in Drawing 337 x 236B, and set them aside in a container. Once these screws are removed, lift the cover off the unit and set it aside.

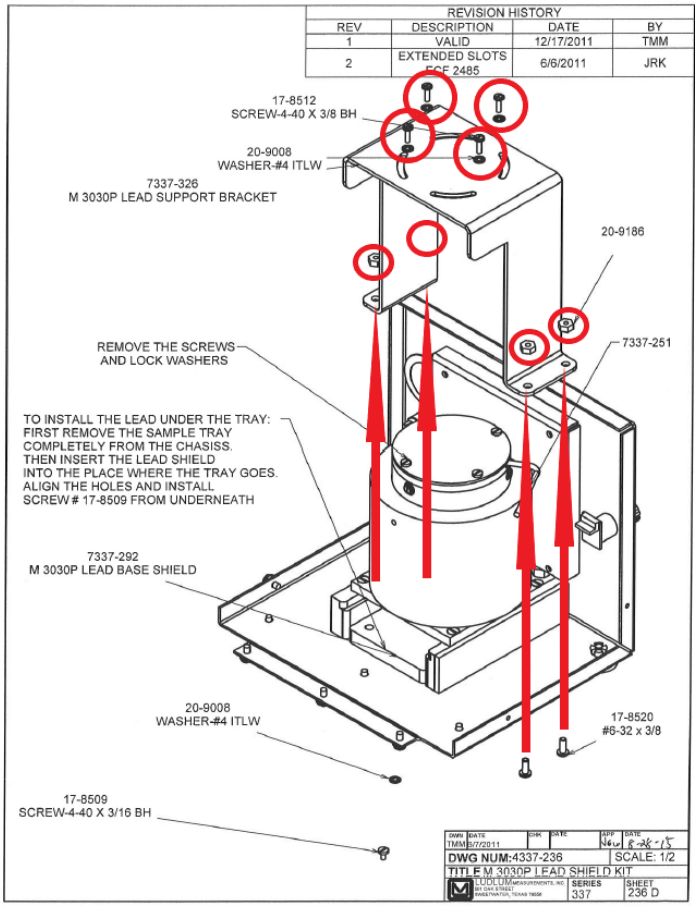


Inside the unit, two connectors from the detector need to be removed from the circuit board to remove the detector assembly. These are circled in the following photo.

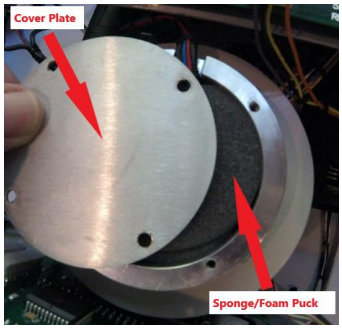


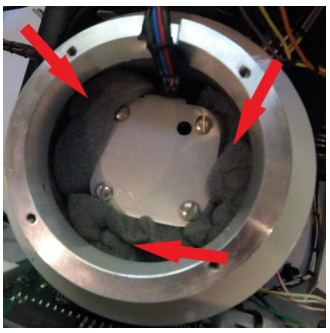
The connector assembly is wire-tied to the left bottom front support post of the circuit board (as viewed from the right photo above). Cut this wire tie and unplug the two connectors from the circuit board.

Now remove the four lock nuts on either side of the lead support bracket using a 7/16th socket and driver and put them aside. The top of the four screws with lock washers holding the lead support bracket to the top of the detector assembly must also be removed and set aside (see Drawing 337 x 236D below). Carefully lift the lead support bracket up and to the side being careful not to hit any connectors or snag any wires.

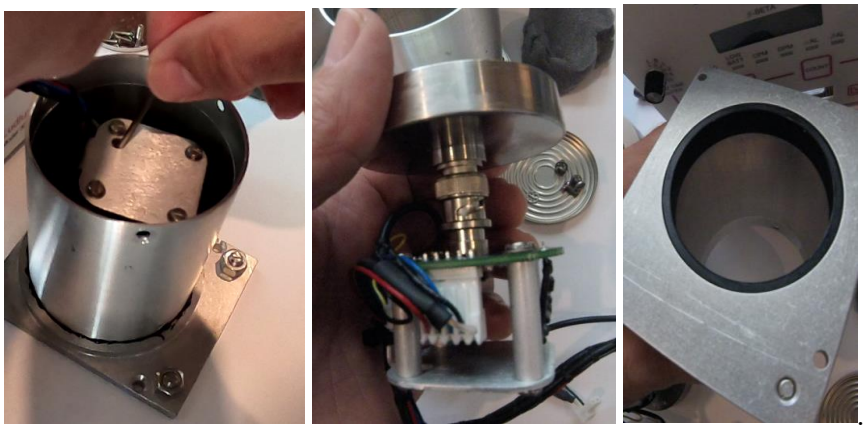


Remove the circular cover plate of the detector housing assembly and set it aside. Directly underneath there will be a foam "sponge" puck that sits on top of the detector/pre-amplifier assembly. Remove the foam puck and set it aside. Inside there are additional foam pucks that need to be removed (see photos below).





Once the foam pucks are removed, the detector assembly can be removed from the detector housing by gently holding the wiring and using the "L" portion of an Allan wrench to lift the detector out of the housing. The detector can be detached from the electronics assembly by twisting the bayonet mount and pulling the detector away from the electronics assembly. At the bottom of the detector housing there is a rubber ring with an O-ring inserted in the outer ring, which has some optical grease on it. The detector sets inside this ring and sets almost flush with the bottom of the entire assembly (shown with assembly removed from the 3030P below).



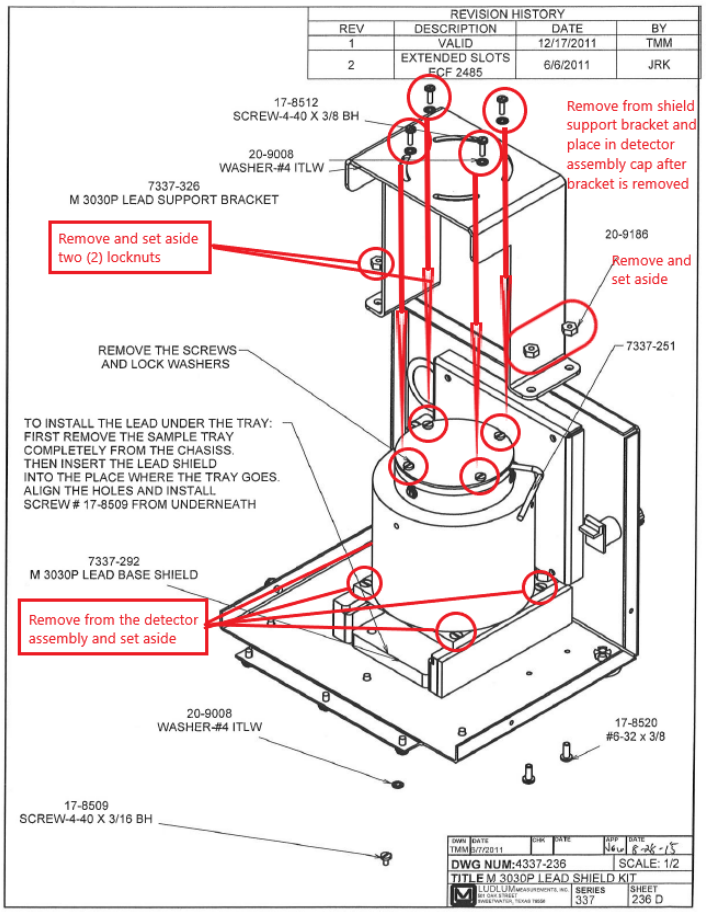
If the detector mounting and O-ring has contamination, an alternative and more extensive process of removing the entire cylindrical detector assembly and shield from the Model 3030P chassis can also be accomplished. Following the same steps above, power down and remove the cover of the Model 3030P and remove the connectors and the lead shield bracket.

Note:

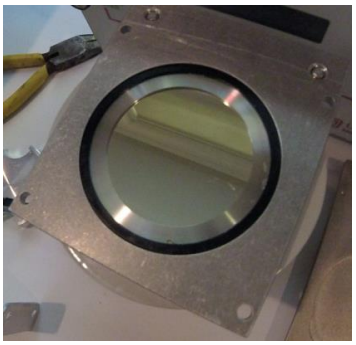
Do not forget to secure the cover plate and re-install the four screws and lock washers in the cover plate. This will allow the whole detector and shielding assembly to be turned upside-down for inspection and cleaning.

Once that is complete, unscrew the four screws holding the shielding and detector assembly (also seen in the lower portion of Drawing 337 x 236D), using a flat-blade screwdriver and set them aside.

The entire lead and detector assembly can be lifted and moved off to the side. Be careful not to snag wires and connections while moving the assembly. The assembly is heavy with the lead, so ensure that you have a firm grasp on it prior to removal. If the detector is placed with side down, make sure that no objects (screws, tools, etc.) are underneath that can damage the PIPS™ detector surface window.



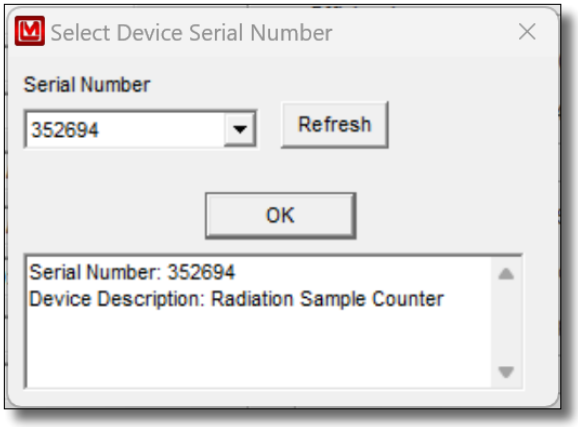
The assembly with the shield may be placed upsid- down and the detector cleaned as described previously or as seen in the PIPS cleaning video. Re-assembly of the system entails reversing the above steps with the replacement of the detector back into the housing, as well as the replacement of the foam pucks and securing the assemblies back into place. The system should be powered up and checked for function prior to securing the cover.



Section 7

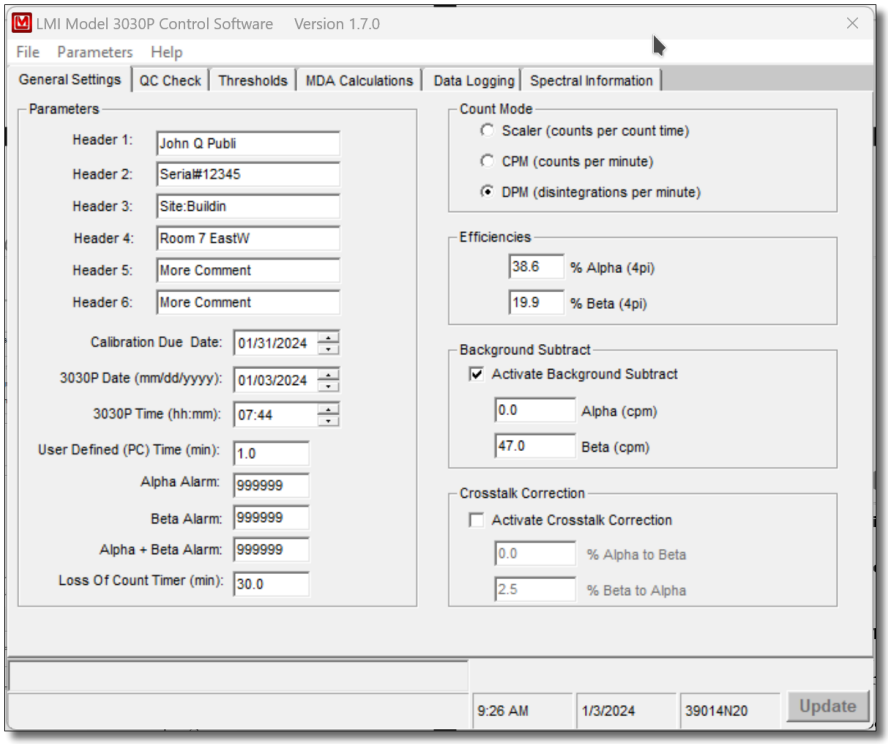
Computer Software

The Model 3030P Control Software allows the user to set all parameters, view QC check settings, change alpha and beta window and threshold values, perform MDA (Minimum Detectable Activity), and retrieve the sample data saved to the logging memory. Certain parameters can be protected by a password to prevent changes that could affect the calibration of the instrument.



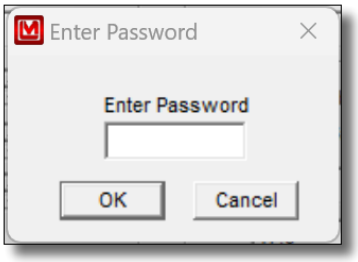
When the software is started, a dialog box is displayed allowing the user to select the instrument serial number from the drop-down list. The number of devices attached, their serial numbers, and the device descriptions are displayed in the text box. After a serial number is selected, the instrument's parameters are downloaded and the main screen is displayed.

The main screen consists of a tabbed interface separating the various functions and includes General Settings, QC Check, Thresholds, MDA Calculation, and Data Logging.



The following parameters require a password: Calibration Date, Date, Time, Background Subtract On/Off, Alpha Background Subtract, Beta Background Subtract, Alpha Efficiency, Beta Efficiency, Crosstalk On/Off, Alpha Crosstalk, and Beta Crosstalk.

The password operation can be enabled in the Parameters menu. Selecting the Password Protect menu item will enable password protection. A check mark next to this menu item will indicate if password protection is on or off. The password is required in order to change this setting.

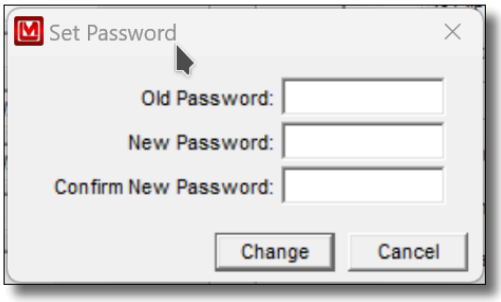


The default password is blank until it is changed by the user using the Change Password menu item. The password can contain the following characters: a-z, A-Z, 0-1,!@# %^&*(). It cannot exceed eight characters in length.

The user is prompted for the password when clicking on the Update button after changing any of the password protected parameters. If the password

given is correct, the parameters are changed and the instrument is updated. If the password is incorrect or the user cancels the password prompt, the previous values for the parameters are restored, with no parameters sent to the instrument.

Once the correct password is entered, the user is not asked for the password again for a period of five minutes after the last time a parameter was changed that required the password. This feature allows the user to only have to enter the password once when performing a series of operations while maintaining the security of the settings if the operator is away from the instrument for a period of time.



Parameters

The Update button at the bottom of the window will save all changes to the instrument.

File Menu/Load Defaults: This menu item loads the file "default.cfg" and saves the settings to the instrument.

Parameters/Update (Ctrl-U): This menu item is the same as clicking on the Update button.

Parameters/Load from File (Ctrl-O): This menu item loads in settings from a user-defined text file.

Parameters/Save to File (Ctrl-S): The menu item will save the current settings to a user-defined file.

Parameters/Reload All Data (Ctrl-R): This menu item will reload all data from the instrument.

Parameters/Print Parameters (Ctrl-P): This menu item will print out a report of all parameters to a printer.

Parameters/Password Protect: When this is checked, certain functions require a password.

Parameters/Change Password: Changes the current password.

Headers 1 through 6: These are six user-defined fields to place general information. These are limited to 12 characters each.

Calibration Due Date: This date is checked when instrument is turned on. If current date is past this date, "OUTCAL" is displayed on the instrument. Setting dipswitch 2 to the ON position will disable this feature.

3030P Date/Time: This is the current date and time from the last time data was read from the instrument.

User Defined Time (min): In addition to the seven preset count times, there is a user-defined count time that can be set from the PC. This is the count time that will be used when the instrument is switched to the PC position.

Alpha, Beta, Alpha+Beta Alarms: These are the alarm settings. A value of 999999 will disable the alarm. If the unit is in CPM, the alarms are in CPM. If the instrument is in DPM, the alarms are in DPM. It is up to the user to make sure that the alarms are set accordingly to the count mode.

Loss of Count Timer: If the detector receives no counts on either the alpha or beta channel after this time expires, the display will show "LOC FAIL" and will not operate until reset. This timer is reset whenever a count is received.

Count Mode: The model 3030P can display the readings in raw scaler counts, CPM, or DPM. If dipswitch 1 is OFF, the unit is always in scaler mode.

The Ludlum Model 3030P can operate as a traditional radiation scaler, displaying measurements in terms of CPM (counts per minute). It can also be programmed to automatically adjust and display the measurements in DPM (disintegrations per minute). By knowing what the efficiency is for alpha and beta particles, the Model 3030P is able to divide measurements by the known efficiency and display in DPM. The DPM mode may be easier for users since many regulations and limits are expressed in terms of DPM.

In raw scaler mode, the count obtained is the actual counts received during that count time. In CPM mode, the counts are adjusted for the count time. In DPM mode, the counts are adjusted for count time and efficiency. For example:

Count Time = 0.1 minutes (6 seconds)

Efficiency = 25%

Input = 1000 DPM

CPM = 250 counts per minute (no background subtract or crosstalk calculations)

DPM = 400 disintegrations per minute (no background subtract or crosstalk calculations)

Alpha/Beta Efficiency: These values are only available when the unit is in DPM count mode. This is used to calculate the DPM reading and is expressed as a percent. The QC mode has a function to update the efficiency with values calculated from the QC check.

Activate Background Subtract: This is only available when count mode is CPM or DPM. This turns on/off the background subtract. It will subtract the background from each channel and display the net count.

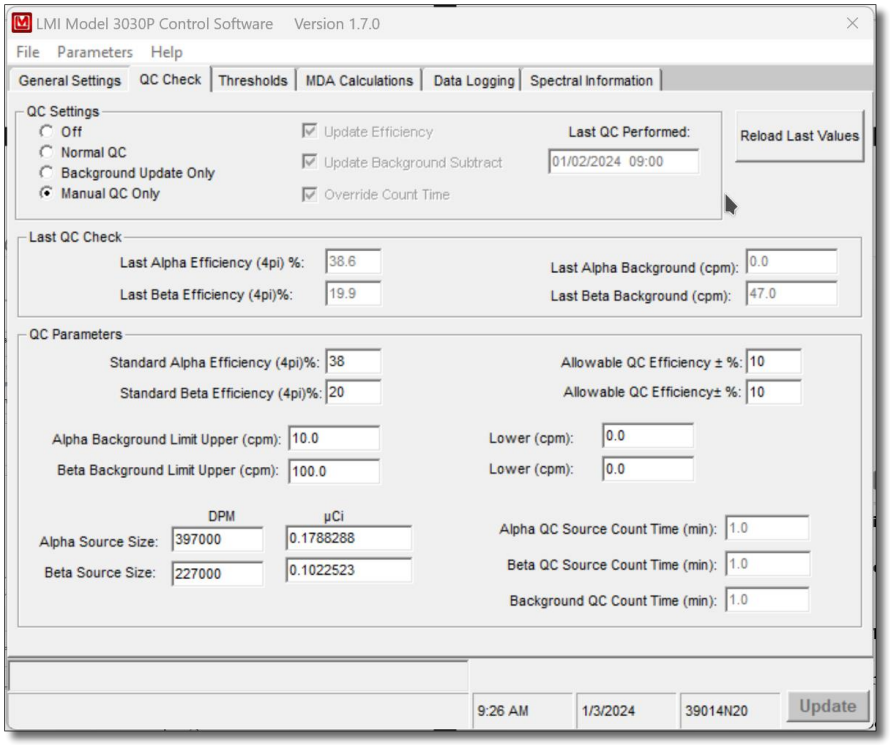
Alpha/Beta Background Subtract: These values will be subtracted while the instrument is counting. For example, in CPM mode, with an input of 2000 CPM and a background subtract value of 1000, the reading will display "1000." The QC mode has a function to update the background subtract with values calculated from the QC check.

Activate Crosstalk Correction: This is only available when count mode is CPM or DPM. This control turns on/off the crosstalk correction.

% Alpha to Beta Crosstalk: This is the percent of alpha counts that are seen by the beta channel. Setting this number to 2% subtracts 2% of the received alpha counts from the beta channel.

% Beta to Alpha crosstalk: This is the percent of beta counts that are seen by the alpha channel. Setting this number to 2% subtracts 2% of the received beta counts from the alpha channel.

QC Check



The Ludlum Model 3030P has a QC Check function that allows the user to determine if the instrument is operating within predetermined limits. This function is optional and does not have to be enabled. There is also an option to update the background every 24 hours. This background update does not validate the received reading with any of the limits set on this screen. It simply takes a background count and stores that reading in the instrument. When the QC Check is enabled, every day the user must perform the QC Check procedure and receive acceptable values in order to utilize the instrument for normal use. After 24 hours, the instrument will light the red indicator marked "QC," and not allow normal use until the next QC check. The predetermined steps are:

1. The instrument counts a specific alpha source with a known activity and receives a specified standard efficiency, plus or minus a specified percentage.

2. The instrument counts a specific beta source with a known activity and receives a specified standard efficiency, plus or minus a specified percentage.

3. The instrument counts background (no source inside the tray) and receives results that are within the upper and lower limits specified.

QC Off/Normal QC/Background Update Only/Manual QC Only: If enabled, 24 hours after the last QC, check the QC LED turns on and a QC check must be run before the normal operation can resume. The "Normal QC" check takes a source count and a background count. The "Background Update Only" takes only background counts and replaces the current background subtract values with the new values. In the Background Update Only mode the display shows the counts in CPM with one decimal place.

Beginning with 39014N20 firmware, the QC check will require pressing the COUNT button to advance to the next step. Also, a new mode called Manual QC Only has been added. When manual QC is enabled, the automatic QC check will not trigger after 24 hours. In this mode, it is necessary to press the QC button to start a QC check.

Update Efficiency: If enabled, the efficiencies calculated during the QC check will replace the efficiencies used for the DPM calculation. This option is only available in the Normal QC check mode.

Update Background Subtract: If enabled, the background readings received during the QC check will replace the current background subtract values. This option is only available in the Normal and Background Only QC check modes.

Override Count Time: If enabled, the count times set by the count time switch on the front of the instrument are overridden.

Last QC Performed: the last date and time a successful QC check was performed

Last Alpha/Beta Efficiency: the last time a QC check was run, this was the computed efficiency

Standard Alpha/Beta Efficiency: These are the values that the QC check will use to determine pass/fail. If the calculated efficiency is outside the Standard Efficiency by the Allowable QC Efficiency %, the QC will fail.

Allowable QC Efficiency ± %: This is the range for how close the computed efficiency must be to the standard. A standard of 25% with an allowable range of 5% specifies that to pass the QC check, the efficiency must be in the range of 20% to 30% to pass.

Source Activity: The DPM value of the source activity is saved to the instrument and is used to determine the efficiency during a QC check.

Alpha QC Source Count Time (min): the Alpha source count time in minutes used when the Override Count Time function is enabled

Beta QC Source Count Time (min): the Beta source count time in minutes used when the Override Count Time function is enabled

Background QC Count Time (min): the background count time in minutes used when the Override Count Time function is enabled

Alpha/Beta Upper & Lower Limits: These determine what range is acceptable for the background during a QC check. If the background does not fall within these values, the QC check will fail.

Steps for Performing a QC Check

1. To enable the QC mode, click on the box marked "Normal QC" in the tab marked "QC Settings."

2. Press the button marked "Reload Last Values" at the top of the screen to see the last values calculated during the last QC check. The data shown includes the Last QC Performed, the Last Alpha Efficiency, the Last Beta Efficiency, the Last Alpha Background, and the Last Beta Background. These numbers are shown for reference ONLY. The QC-check predetermined limits must be chosen and input by the user.

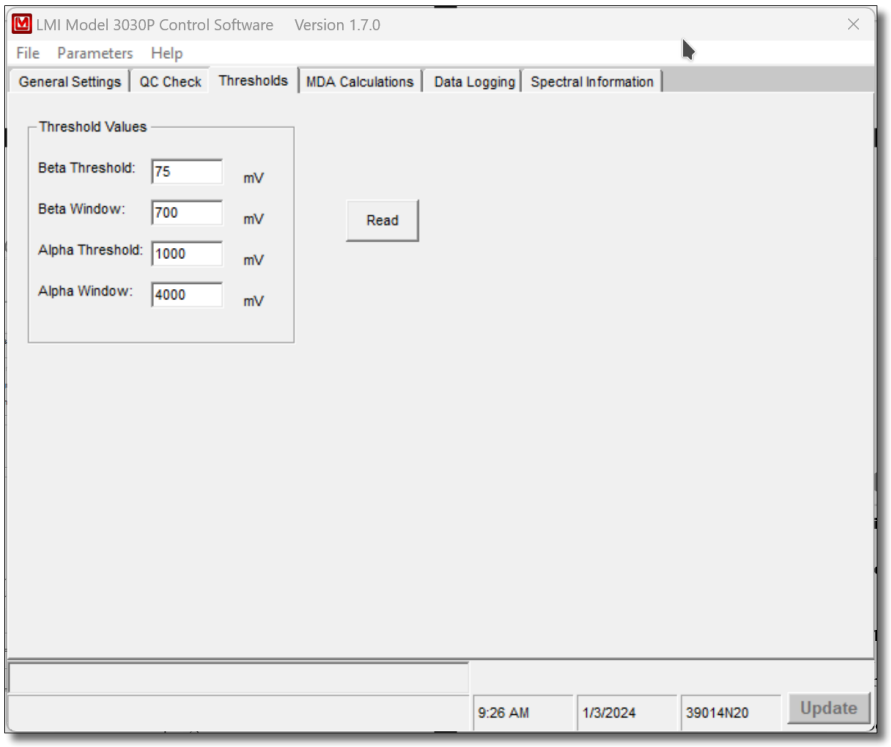
3. Enter values for the Standard Alpha Efficiency and the Standard Beta Efficiency. The values input here should reflect the average efficiency with the given sources. After entering the values, press the Update button.

4. Enter values for the Allowable QC Efficiency. These percentage values entered allow the instrument to accept efficiencies that are somewhat higher and lower than the standard efficiency. For example, if the Standard Alpha Efficiency is 25% and the Allowable QC Efficiency is 5%, the acceptable alpha efficiency will be from 20% to 30%. After entering the values, press the Update button.

5. Enter the Alpha Source Activity and Beta Source Activity of the sources to be used during the QC check. It is preferred to use the DPM or μCi column wherever possible. Conversion from CPM to DPM using a factor of 2 may not be correct, depending on isotope and source material. After entering the values, press the Update button.

Enter in upper and lower background limits for both alpha and beta background. Since alpha background is usually very low, it is acceptable to use a lower limit of 0. After entering the values, press the Update button.

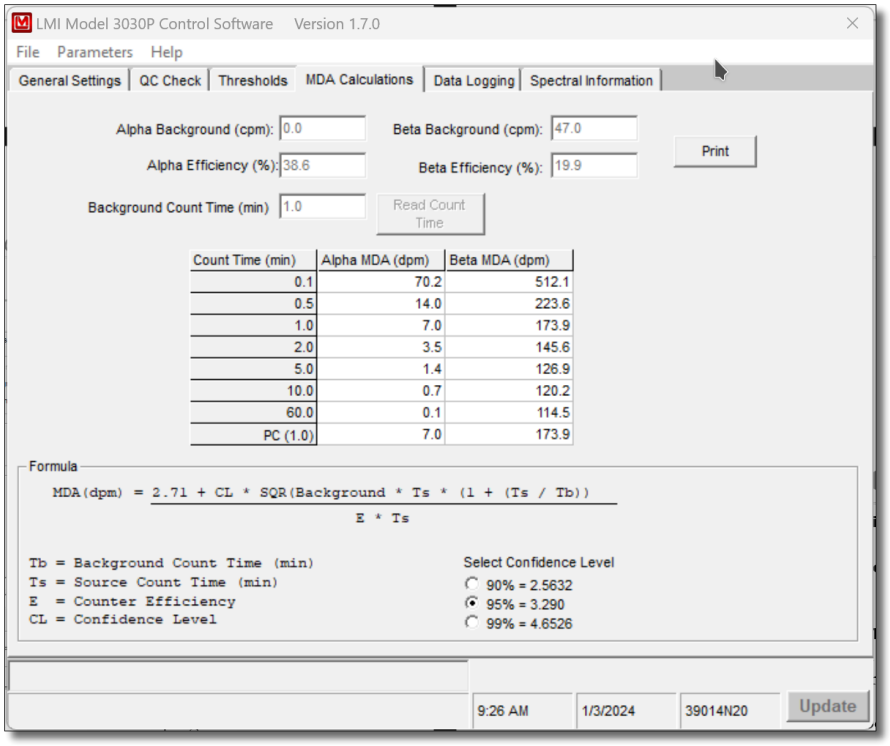
Changing Thresholds



Read: Pressing this button will read the current instrument threshold and window settings for alpha and beta.

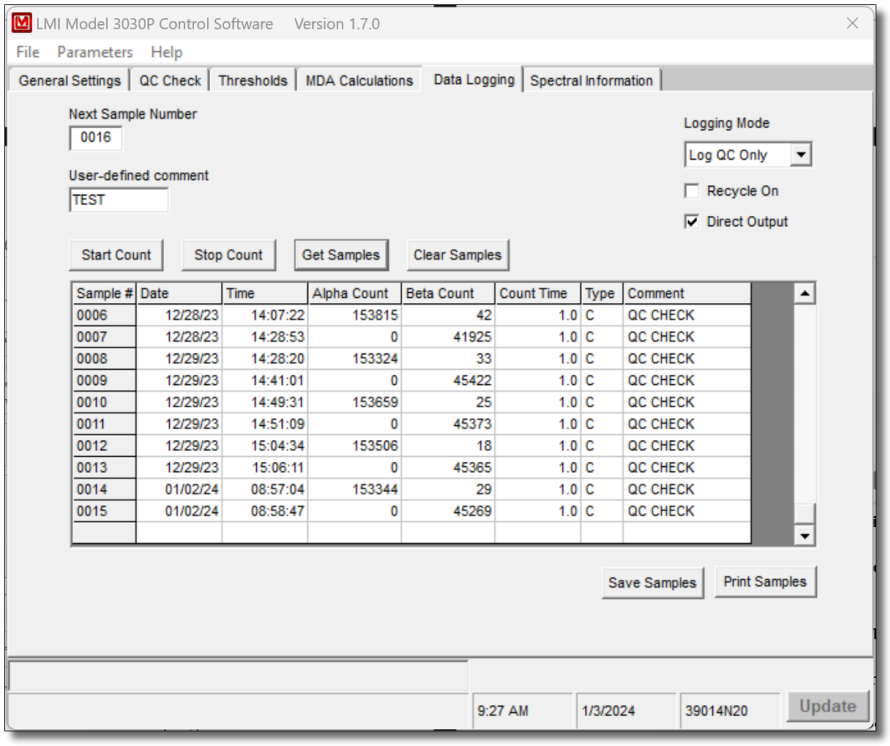
Update: Pressing this button will update the instrument with changes to the alpha and beta threshold and window, and will update other changes made in other tabs.

MDA Calculations



This screen shows the calculated MDA values for all count times based on the current background and efficiency values. The confidence level may be set at 90%, 95%, or 99%. This screen is only available when the instrument is in DPM mode. The data may also be printed to a printer.

Data Logging



The Model 3030P can store 600 samples in its data logging memory. The following fields are stored with each sample: time, date, alpha reading, beta reading, count time, count mode, and user-defined comment.

Logging Mode: The choices are either Off, Log All, or Log QC only. This will activate the saving of samples to the instrument's non-volatile memory.

Recycle On: This will activate the recycle function. As soon as the count completes, another one is started automatically.

Direct Output On: When activated, the instrument will output the count data to the serial port. No handshaking is active. A serial printer may be connected to display the data. The date, time, alpha reading, beta reading, count mode, and count time is output. The count mode is indicated by a single letter: C=cpm, D=dpm, S=scaler.

*Note: If using the software while connected to a printer, when commands are sent to the instrument, the responses will be sent to the printer as well.

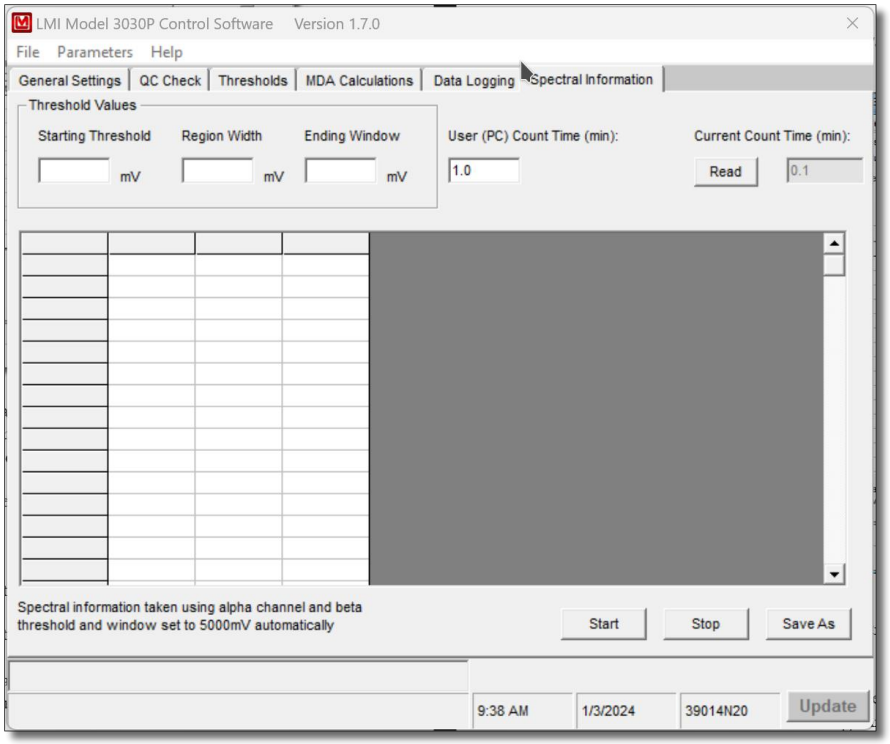
Get Samples: This button reads all sample data from the instrument.

Clear Samples: This button clears the instrument of all samples in memory.

Save Samples: Allows saving the sample data to a user-defined file. The data is saved in a comma delimited (*.csv) file to allow for importing into other applications.

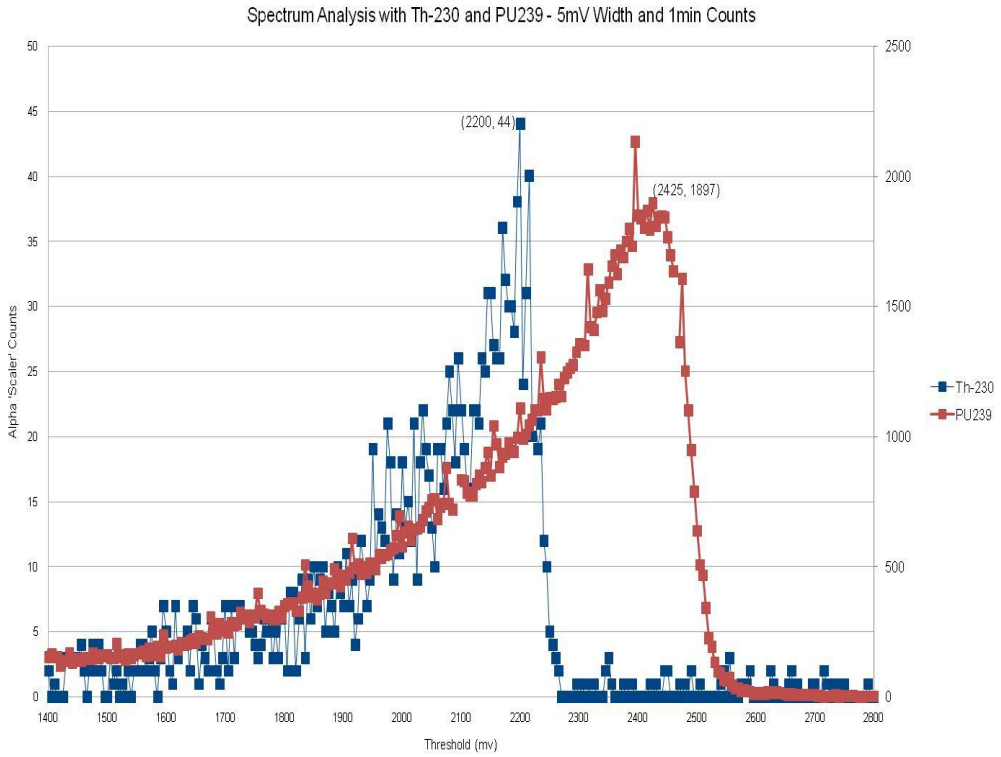
Print Samples: Prints the sample data to a printer. If connected to a PC the sample data will be immediately printed to the default printer.

Spectral Information



The spectral information tab is useful for generating an alpha spectrum for an unknown sample. This process is slow; essentially the unit adjusts the threshold and window and takes a reading at each step within the specified range. The user can choose the beginning threshold, the region width, and the ending window set points (all in mV). The user also chooses the count time for each step. When the count time is chosen, the time switch on the instrument needs to be set to "PC." If the 3030P is not set to PC control, the spectral data acquisition time is determined by the setting on the 3030P. Pressing the "Read" button in the Spectral Information Tab will confirm the count time that will be used. A table is generated as the data is collected. When

the process is complete, the user may save the file to a comma-delimited (.csv) file. This file may be plotted to produce a spectra like this:



Suggested setup for acquiring a spectrum using the Model 3030P is as follows:

Window width: 10 mV
Starting Threshold: 100 mV
Ending Threshold: 2800 mV
Count Time: 6 seconds

USB Communication

The Model 3030P communicates by way of a USB interface. A standard type A to type B USB cable is required.

The Model 3030P uses the line-feed character [LF] to terminate commands. It is acceptable to terminate commands with a carriage return and a line feed character. All messages received from the Model 3030P are terminated with a carriage return and line-feed character.

The commands are not case sensitive. Any command not recognized will return "ERROR-xx" where xx is the first two characters of the unknown command.

[LF] = line feed character (ASCII value 10)
[CR] = carriage return character (ASCII value 13)

COMMANDS

Bn – Background Subtract Status

This command sets background subtract ON/OFF or return background subtract status, where "n" is a value of 0, 1, or 2.

0 = Sets background subtract OFF.
1 = Sets background subtract ON.
2 = Returns status.

Cn - Count

This command performs various count functions. The count time is determined by the positioning of the COUNT TIME SWITCH on the front panel unless otherwise noted. See command RR for the format of the count results.

1 = Start a count.
2 = Stop a count in progress.
3 = Clear alarms.
4 = Start a count and automatically return the results.
5 = Start a one-minute count and automatically return the results.

Dn – Display Mode

The display can be set to display count data as raw scaler counters, counts per minute (CPM), and disintegrations per minute (DPM).

0 = Set display mode to scaler.
1 = Set display mode to CPM.
2 = Set display Mode to DPM.
3 = Return display mode (SCA, CPM, or DPM).

F – Firmware

This command returns a string containing the firmware version number.

Ln – Logging Mode

This command sets how samples are logged to internal memory.

0 = Turn logging OFF.
1 = Turn Logging ON.
2 = Log only QC checks.
3 = Return logging mode (OFF, ON, or QC).

Pn

This command sets printer mode On/Off.

0 = Turn printing OFF.
1 = Turn printing ON.
2 = Return printing mode (OFF, ON).

Qx

This command sets quick power-on mode. The Model 3030P may be configured to display certain parameters during power-up.

0 = Show parameters OFF.
1 = Show parameters ON.
2 = Return power-up mode (OFF, ON).

RA – Read Next Sample Number

This command reads the next sample number. Subtract one from this number to get the total number of samples logged. Returns "nnnn."

RBn – Read Background Subtract

This command reads the alpha or beta background subtract value. The value returned must be divided by 10 to get the correct value. Returns "nnnnnn."

1 = Read alpha background subtract.
2 = Read beta background subtract.

RC – Read Calibration Due Date

This command reads the calibration due date. Returns "MMDDYYYY."

RD – Read Current Date and Time

This command reads the current date and time. Returns "HH:MM:SS MM/DD/YYYY."

REn – Read Efficiency

This command reads the alpha or beta percent efficiency. The value returned must be divided by 10 to get the correct value. Returns "nnn."

1 = Read alpha percent efficiency.
2 = Read beta percent efficiency.

RHn – Read Header

This command reads the 15-character, user-definable header where "n" is a value from 1 to 6. Returns "xxxxxxxxxxxxxx."

RL – Read Loss of Count Timer

This command reads the loss of count timer value in seconds. Returns two lines. Line 1 contains the count time as "nnnnn.n." Line 2 returns "BETA" if the loss of count timer has expired otherwise "OK" is returned.

RNn – Read MDA

This command reads the Minimum Detectable Activity (MDA). Returns "nnnnnn."

1 = Read alpha ratemeter MDA.
2 = Read beta ratemeter MDA.
3 = Read alpha scaler MDA.
4 = Read beta scaler MDA.

RP – Read the PC Time

This command reads the PC or user-defined count time in seconds. The PC time is used when the COUNT TIME SWITCH on the front panel is set to PC. Returns "nnnnn.n."

RQn

This command reads the specified QC parameter.

01 = Reads QC enabled status. Returns "ON" or "OFF."
02 = Reads current alpha efficiency %. Returns "nn."
03 = Reads current beta efficiency %. Returns "nn."
04 = Reads standard alpha efficiency %. Returns "nn."
05 = Reads standard beta efficiency %. Returns "nn."
06 = Reads alpha source size (cpm). Returns "nnnnnn."
07 = Reads beta source size (cpm). Returns "nnnnnn."
08 = Reads alpha efficiency limit %. Returns "nn."
09 = Reads beta efficiency limit %. Returns "nn."
10 = Reads alpha background upper (cpm). Returns "nnnnnn."
11 = Reads alpha background lower limit (cpm). Returns "nnnnnn."
12 = Reads beta background upper (cpm). Returns "nnnnnn."
13 = Reads beta background lower limit (cpm). Returns "nnnnnn."

14 = Reads last QC date. Returns "MM/DD/YYYY."
15 = Reads alpha background (cpm). Returns "nnnnnn."
16 = Reads beta background (cpm). Returns "nnnnnn."
17 = Reads last QC time. Returns "HH:MM."
18 = Reads QC Mode. Returns "NOR" or "BKG."
19 = Reads QC Update Mode. Returns "OFF," "ON," EFF," or "SUB."
20 = Reads alpha source count time (secs). Returns "nnnnn.n."
21 = Reads beta source count time (secs). Returns "nnnnn.n."
22 = Reads background count time (secs). Returns "nnnnn.n."
23 = Reads QC override status. Returns "OFF" or "ON."

RR – Read Count

This command reads the current alpha and beta counts. Returns "HH:MM MM/DD/YY aaaaaa bbbbbb x tttt.t."

aaaaaa = alpha count
bbbbbb = beta count
x = S (scaler), C (cpm), and D (dpm)
tttt.t = count time in minutes (If count is in progress, this value shows count time remaining.)

RS – Read Samples

This command reads all logged samples from memory. While reading samples, the audio is stopped and the displays show a scrolling series of dashes along with the sample number. A "$" marks the end of the samples.

Returns: "ssss MM/DD/YY HH:MM:SS aaaaaa bbbbbb ttttt.t x ccccccccccc[CR][LF] - 59 bytes $[CR][LF] - 3 bytes"

ssss = sample number
aaaaaa = alpha scaler
bbbbbb = beta scaler
x = S (Scaler), C (cpm), and D (dpm)
ttttt.t = count time in seconds
ccccccccccc = user defined comment

RT – Read Current Count Time

This command reads the current count time in seconds. Returns "nnnnn.n."

RU – Read Comment

This command reads the user-defined, 10-character comment field. Returns "xxxxxxxxxx."

RXn – Read the Crosstalk

This command reads the beta-to-alpha or alpha-to-beta crosstalk. The value must be divided by 10 to get the correct value. Returns "nnn."

1 = Reads beta-to-alpha crosstalk.
2 = Reads alpha-to-beta crosstalk.

RY – Read Recycle Mode Status

This command reads the status of the recycle mode. Returns "OFF" or "ON."

Rn – Read the Alarm Set Points

This command reads the specified alarm set point. Returns "nnnnnn."

1 = Read alpha alarm set point.
2 = Read beta alarm set point.
3 = Read alpha + beta alarm set point.

Xn – Set Crosstalk Mode

This command sets crosstalk ON/OFF or returns crosstalk status, where "n" is a value of 0, 1, or 2.

0 = Sets crosstalk OFF.
1 = Sets crosstalk ON.
2 = Returns status.

SBnxxxxxx – Set Background Subtract

This command sets the alpha or beta background subtract.

1 = Set alpha background subtract.
2 = Set beta background subtract.

SCmmddyyyy – Set Calibration Date

This command sets the calibration due date.

SDmmddyyyyz – Set Date

This command sets the date on the read-time clock. The "z" is the value of the year Mod 4.

SEnxxx – Set Efficiency

This command sets the alpha or beta efficiency. The efficiency must be multiplied by 10 before sending.

1 = Set alpha efficiency.
2 = Set beta efficiency.

SHnxxxxxxxxxxxxxxx – Set Header

This command sets a user-defined header. There are six headers accessed 1-6. Each header is 15 characters long.

SLyyyyy.y – Set Loss of Count Timer

This command sets the loss of count timer in seconds. The maximum is 99999.9 seconds. A time of 0 will disable this function.

SNnyyyyyy – Set MDA

This command sets the alpha and beta MDA.

1 = Set alpha MDA.
2 = Set beta MDA.

SPxxxxx.x

This command sets the user-defined count time when the COUNT TIME SWITCH is in the PC position. The maximum is 99999.9 seconds.

SQnn – Set QC parameters

This command sets the specified QC parameter.

01 = Set QC enabled status, 0 = OFF, 1 = ON.
04 = Set standard alpha efficiency %., format ##
05 = Set standard beta efficiency %, format ##
06 = Set alpha source size (cpm), format ######
07 = Set beta source size (cpm), format ######
08 = Set alpha efficiency limit %, format ##
09 = Set beta efficiency limit %, format ##
10 = Set alpha background upper (cpm), format ######
11 = Set alpha background lower limit (cpm), format ######
12 = Set beta background upper (cpm), format ######
13 = Set beta background lower limit (cpm), format ######
17 = Set last QC time, format HHMM
18 = Set QC Mode, 0 = NOR, 1 = BKG
19 = Set QC Update Mode, 0 = OFF, 1 = ON, 2 = EFF, 3 = SUB

20 = Set alpha source count time (secs), format #####.#
21 = Set beta source count time (secs), format #####.#
22 = Set background count time (secs), format #####.#
23 = Set QC override status, 0 = OFF, 1 = ON

SR – Reset All Samples

This command clears all logged samples from memory.

SThhmm – Set Time

This command sets the real-time clock. Seconds are always started at 00.

SUxxxxxxxxxx – Set Command

This command sets a user-defined, 10-character comment, which is saved with the logged samples.

SXnyyy – Set Crosstalk

This command sets the beta-to-alpha or alpha-to-beta crosstalk. The crosstalk must be multiplied by 10 before sending.

1 = Set beta-to-alpha crosstalk.
2 = Set alpha-to- beta crosstalk.

SYn – Set Recycle Mode

This command sets recycle mode. If recycle mode it ON, after a count completes, another one will be started automatically.

0 = Set recycle mode OFF.
2 = Set recycle mode ON.

Snxxxxxx – Set Alarm

This command sets the specified alarm set point.

1 = Set alpha alarm set point.
2 = Set beta alarm set point.
3 = Set alpha + beta alarm set point.

Sample Printouts

Ludlum Measurements, Inc.
Model 3030P MDA Calculation Data

02/02/2009
11:05:07 AM

Instrument Serial Number: 251450

Alpha Background(cpm): 0.0
Beta Background (cpm): 34.8

Alpha Efficiency %: 38.0
Beta Efficiency %: 20.0

Confidence Level: 95%

Count Time	Alpha MDA(dpm)	Beta MDA(dpm)
0.1	71.3	458.3
0.5	14.3	195.7
1	7.1	151.2
2	3.6	126.0
5	1.4	109.3
10	0.7	103.4
60	0.1	98.4
PC (0.1)	71.3	458.3

Ludlum Measurements, Inc.
Model 3030P Sample Data

02/02/2009
06:59:57 PM

Instrument Serial Number: 251450

Header 1: John Q Publi
Header 2: Serial#12345
Header 3: Site:Buildin
Header 4: Room 7 EastW
Header 5: More Comment
Header 6: More Comment

Calibration Due Date: 1/30/2010

Last QC Check: 1/30/2009 03:18

Sample #	Date	Time	Alpha Count	Beta Count	Count Time	Type	Comment
001	02/02/2009	06:59:25	436520	18850	0.1	D	Text
002	02/02/2009	06:59:34	430810	19250	0.1	D	Text
003	02/02/2009	06:59:43	164469	3699	0.1	C	Text
004	02/02/2009	06:59:52	165199	3429	0.1	C	Text
005	02/02/2009	07:00:01	164190	3619	0.1	C	Text
005	02/02/2009	07:00:10	16262	362	0.1	S	Text
006	02/02/2009	07:00:19	16543	370	0.1	S	Text

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Section

8

Recycling

Ludlum Measurements, Inc. supports the recycling of the electronic products it produces for the purpose of protecting the environment and to comply with all regional, national, and international agencies that promote economically and environmentally sustainable recycling systems. To this end, Ludlum Measurements, Inc. strives to supply the consumer of its goods with information regarding reuse and recycling of the many different types of materials used in its products. With many different agencies – public and private – involved in this pursuit, it becomes evident that a myriad of methods can be used in the process of recycling. Therefore, Ludlum Measurements, Inc. does not suggest one particular method over another, but simply desires to inform its consumers of the range of recyclable materials present in its products, so that the user will have flexibility in following all local and federal laws.

The following types of recyclable materials are present in Ludlum Measurements, Inc. electronic products and should be recycled separately. The list is not all-inclusive, nor does it suggest that all materials are present in each piece of equipment:

Batteries, Glass, Aluminum, Stainless Steel

Circuit Boards, Plastics, Liquid Crystal Display (LCD)

Ludlum Measurements, Inc. products that have been placed on the market after August 13, 2005, have been labeled with a symbol recognized internationally as the "crossed-out wheelie bin," which notifies the consumer that the product is not to be mixed with unsorted municipal waste when discarding; each material must be separated. The symbol will be placed near the AC receptacle, except for portable equipment where it will be placed on the battery lid.

The symbol appears as such:

Section 9

Parts List

	Reference	Description	Part Number
Model 3030P Alpha-Beta Sample Counter	UNIT	Completely Assembled M3030P Alpha-Beta Sample Counter	48-3509
Main Board Drawing 337 × 245	BOARD	Completely Assembled Main Board	5337-245
CRYSTALS	Y1	Micro 6.144 MHz	01-5262
	Y2	Micro 6.00 MHz	01-5696
	Y3	Micro 32.768 KHz	01-5305
CAPACITORS	C1	10µF, 25V	04-5655
	C2	0.1µF, 100V	04-5792
	C3-C8	0.1µF, 250V	04-5772
	C9-C16	0.1µF, 100V	04-5792
	C17	22µF, 100V	04-5799
	C18	100pF, 3KV	04-5735
	C19	100pF, 100V	04-5661
	C20-C25	100µF, 16V	04-5794
	C26-C32	0.1µF, 100V	04-5792
	C33	100µF, 16V	04-5794
	C34-C37	1µF, 16V	04-5701
	C38	0.001µF,2KV	04-5703
	C39-C49	0.1µF, 100V	04-5792
	C50-C51	27pF, 100V	04-5658
	C52	0.1µF, 100V	04-5792
	C53-C54	27pF, 100V	04-5658
	C55	10pF, 100V	04-5972
	C56-C58	10µF, 25 V	04-5728

	Reference	Description	Part Number
	C59-C63	47pF, 100V	04-5660
	C64-C66	100pF, 100V	04-5661
	C67-C68	10µF, 25V	04-5728
	C69	1µF, 16V	04-5701
TRANSISTORS	Q1-Q3	2N7002L	05-5931
	Q4	LTC1144	05-5923
INTEGRATED CIRCUITS	U1-U2	SN74AHC1G14	06-6556
	U3	OPA2349EA	06-6712
	U4	LT1304CS8	06-6394
	U5	AT89C51RC2	06-6893
	U6	LT1304CS8-5	06-6434
	U7	MAX232D	06-6382
	U8	MAX810LEUR	06-6424
	U9	LTC4365	06-7005
	U10	93LC66B	06-6732
	U11	PCF8593TD	06-6403
	U12-U13	24C65ISM	06-6401
	U14-U15	CD74HC4538	06-6686
	U16-U19	MAX998	06-6674
	U20	DAC124S085	06-6734
	U21	IRF7303PBF	05-5971
	U22	FT232BL	06-6733
DIODES	CR1-CR3	CMPD2004S	07-6402
	CR4	CMSH1-40M	07-6411
	CR5-C9	MMBD914LT1	07-6353
	CR11-C13	CMSH1-40M	07-6411
	CR14-CR15	MMBD914LT1	07-6353
RESISTORS	R1-R9	100K, 1/4W, 1%	12-7834
	R10	500M, 330mW, 10%	12-7045
	R11	1M, 1/10W, 1%	12-7081
	R12	100K, 1/4W, 1%	12-7834
	R13	9.1Meg, 0.1W, 5%	12-7208
	R14-R19	10K, 1/8W, 1%	12-7839
	R20	22.1K 1/8W, 1%	12-7843
	R21	10K, 1/8W, 1%	12-7839
	R22	1.5K, 1/8W, 1%	12-7878
	R23	27.4OHM, 1/4W, 1%	12-7041

	Reference	Description	Part Number
RESISTORS	R24-R30	22.1K 1/8W, 1%	12-7843
	R31	2.21K, 1/4W, 1%	12-7835
	R32	27.4OHM, 1/4W, 1%	12-7041
	R33	1.5K, 1/8W, 1%	12-7878
	R34	27.4OHM, 1/4W, 1%	12-7041
	R35	1K, 1/8W, 1%	12-7832
	R36	475OHM, 1/4W, 1%	12-7851
	R37	27.4OHM, 1/4W, 1%	12-7041
	R38	68.1K, 1/8W, 1%	12-7881
	R39	100K, 1/4W, 1%	12-7834
	R40	475OHM, 1/4W, 1%	12-7851
	R41-R44	22.1K 1/8W, 1%	12-7843
	R45	1K, 1/4W, 1%	12-7832
	R46	2.1M, 1/4W, 1%	12-8310
	R47	110K, 1/4W, 1%	12-7052
	R48	191K, 1/4W, 1%	12-8299
	R49	100K, 1/4W, 1%	12-7834
CONNECTORS	J1	RAPC712	13-8445
	J2	67068-8000 USB	13-8575
	P1	640445-3	13-8125
	P2-P3	640456-5 MTA100	13-8057
	P4	1-640456-2 MTA100	13-8066
	P5	640456-6 MTA100	13-8095
	P6	5747020-1	13-8555
	P7	640456-2 MTA100	13-8073
MISCELLANEOUS	L1	220uH	21-9678
	L2	22uH	21-9808
	L3-L4	Inductor	21-9009
	L5	22uH	21-9808
	L6	Inductor	21-9008
	SW1	DF62J1252AHQA	08-6840
	SW2	SW DIP-2	08-6712
	CR16	LM385M3-1.2	05-5881
	B1	LITHIUM BATTERY 3V	22-9786
Preamp Board, Drawing 337 × 335	BOARD	Completely Assembled Preamp Board	5337-355

	Reference	Description	Part Number
CAPACITORS	C1-C2	330pF, 100V	04-5657
	C3	0.001µF, 100V	04-5659
	C4	330pF, 100V	04-5657
	C5	10pF, 100V	04-5673
	C6	0.1µF, 100V	04-5792
	C7	0.01µF, 500V	04-5747
	C8	1µF, 16V	04-5701
	C9-C10	0.1µF, 100	04-5792
	C11	10 µF, 10V	04-5968
	C13- C14	100µF, 16V	04-5794
	C15-C16	2.2µF, 50V	04-5490
	C17-C18	0.1µF, 100V	04-5792
	C19	10 µF, 10V	04-5968
	C20-C24	0.1µF, 100	04-5792
TRANSISTORS	Q1	MMBT3904LT1G	05-5841
	Q2	MMBT3906LT1	05-5925
INTEGRATED CIRCUITS	U1	LM6172IMX	06-6737
DIODES	CR1-CR2	MMBD914LT1G	07-6353
	CR3-CR4	MMSZ5236B-V-GS08	07-6539
INDUCTORS	L1-L2	220µh	21-9678
RESISTORS	R1-R4	1K, 1/4W, 1%	12-7832
	R5	10K, 1/4W, 1%	12-7839
	R6-R7	1K, 1/4W, 1%	12-7832
	R8	10K, 1/4W, 1%	12-7839
	R9	10M, 1/4W, 5%	12-7955
	R10	100M, 330mW, 10%	12-7044
	R11	49.9 OHM, 1/10W, 1%	12-7138
	R12	10K, 1/10W, 1%	12-7083
	R13	49.9 OHM, 1/10W, 1%	12-7138
	R14	10K, 1/10W, 1%	12-7083
	R15	49.9OHM, 1/4W, 1%	12-7011
	R16	475K, 1/4W, 1%	12-7858
CONNECTORS	P1	BNC-50 OHM	13-7740
	P2	CONN-MTA100 640456-5	13-8057

	Reference	Description	Part Number
	P3	CONN-MTA100 640456-2	13-8073
MISCELLANEOUS	C12	Preamp Module 8Pin SIP	2311492
	R17	TRMR-10K 3266W1-103LF	09-6824
Display Board, Drawing 337 x 89	BOARD	Completely Assembled Display Board	5337-084
	C1	47µF, 10V	04-5666
CAPACITORS	C2-C5	0.1µF 50V	04-5663
	C6, C7	27pF, 100V	04-5658
TRANSISTORS	Q1, Q2	2N7002L	05-5840
INTEGRATED CIRCUITS	U1	PCF8574TD	06-6402
	U2-U5	AYO438-I/L	06-6358
RESISTORS	R1, R2	4.75K, 1/8W, 1%	12-7858
	R3, R4	22.1K, 1/8W, 1%	12-7843
	R5	200 OHM 1/4 W, 1%	12-7846
	R6-R11	100 OHM, 1/4W, 1%	12-7840
	R12-R16	10K, 1/8W, 1%	12-7839
	R17	100K, 1/8W, 1%	12-7834
	R19	200 OHM 1/4 W, 1%	12-7846
	R20	100K, 1/8W, 1%	12-7834
CONNECTORS	P1	MTA100 1-640457-0	13-8168
DIODES	DSP1, DSP2	3918-365-920LCD	07-6252
	DS1-DS4	HLMP-2300/2304	07-6377
	DS5, DS6	HLMP-2500 GRN BAR	07-6403
	DS7, DS8	LED BACKLITE	07-6451
SWITCHES	SW1, SW2	SW-3CTH9 PB	08-6716

Wiring Diagram, Drawing 337 x 354

	Reference	Description	Part Number
AUDIO	DS1	UNIMORPH – MZ35290BDO	21-9251
CONNECTORS	J1	CONN-3-640428-3 MTA156	13-8124
	J2, J3, J9, J11	CONN-3-640441-5 MTA100	13-8463
	J4, J10	CONN-4-640441-0 MTA100	13-8197
	J5	CONN-3-640441-6 MTA100	13-8373
	J7, J8	CONN-3-340441-2 MTA100	13-8196
	SW1	SWITCH-SS12BT30-102L4	08-6532
BATTERY	B1, B2	2 EA. 1.5 VOLT "D" DURACELL	21-9313
RESISTORS	R1	POT-10K RV6NAYSD103A-PNON-LKG	09-6753
MISCELLANEOUS	KNOBS	KNOB-PKG-508-1/8	08-6601
	FEET	BUMPER SELF-LOCKING K717	21-8717
	BATT HOLDER	BATERY-HOLDER BXS017	22-9400
DETECTOR	D1	PIPS™ DETECTOR-CAM 1700ABM	01-5811

Section

10

Changes

Software

Version 1.7.0 – Added support for N20 firmware. Added manual QC mode option.

Version 1.6.9 – Added delay when reading parameters.

Version 1.6.8 – Fixed where PDF manual didn't open under help menu.

Version 1.6.7 - Fixes issues with not being able to retrieve spectral data with the C4 command. Changed to use 3030 version of SendCommand(). Fixed where stopping a spectral count would have to wait for the count time to fully expire. These fixes should make the app work correctly under Windows 10 and above. Added in latest FTDI drivers.

Version 1.6.6 - Fixed UpdateMDAGrid to use doubles instead of integers for the background values.

Version 1.6.5 – Fixed issues with regions that swap decimal and comma.

Version 1.6.4 – Bug fixes.

Version 1.6.3 – Test version – not released.

Version 1.6.2 – Fixed issue downloading samples with max samples logged. Fixed parameters report where crosstalk correction values were reversed.

Version 1.6.1 – Requires firmware N12 or higher. Change default values. Changes to serial communication to improve reliability.

Version 1.6.0 – Requires firmware N09 or higher. Added spectral information tab.

Version 1.5.0 – Requires firmware N08 or higher. USB communication.

Version 1.4.0 – First version – not released.

Firmware

Standard

39014N20 – Changed QC mode to work the same as the 3030. COUNT button is used to advance to next step.

39014N17 – Fixed where clock chip wasn't stopped when setting the timer which caused inconsistent QC intervals.

39014N15 – Change to use clock timer to trigger 24-hour QC check.

39014N14 – Previous versions stopped checking once QC was needed, now keep on checking.

39014N13 – Fixed wwhere bOverrideCountTime is not loaded at start-up.

39014N12 – Fixed so parameters never show at start-up. Fixed where threshold values were not loaded at start-up.

39014N11 – Removed some dev code that wasn't needed.

39014N10 – Fixed where cal date month was not correct.

39014N09 – Fixed communication issues.

39014N08 – Moved some variables to XRAM to get more room for stack.

39014N07 – Attempt to fix up communication lockups.

39014N04 – Fixed issues with LOW BAT LED. More changes to communications.

39014N03 – Fixed DAC and USB communications.

39014N02 – DAC and USB not working.

39014N01 – Started with 3030 firmware.

30-hour QC

39014N19 – Test version for 30-hour QC to investigate RTC running fast. Not released as this was a hardware issue.

39014N18 – Fixed version for 30-hour QC. Fixed where clock chip wasn't stopped when setting the timer which caused inconsistent QC intervals.

39014N16 – First version of 30-hour QC.

Section

11

Drawings and Diagrams

Model 3030P Main Board, Drawing 337 × 245 (4 sheets)

Model 3030P Main Board Layout, Drawing 337 x 246 (2 sheets)

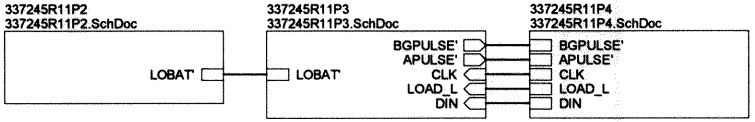
Model 3030P Detector Preamp Board, Drawing 337 X 335

Model 3030P Detector Preamp Board Layout, Drawing 337 x 356A (2 sheets)

Model 3030P Display Board, Drawing 337 × 88 (4 sheets)

Model 3030P Display Board Layout, Drawing 337 x 89

Model 3030P Wiring Diagram, Drawing 337 x 354



LUDLUM MEASUREMENTS, INC.		PO Box 810 501 Oak Street Sweetwater, Texas 79556 U.S.A. 1-800-622-0828	
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Design: RSS	2/10/2022	Model: 3030P	
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Approve: RMS 10 of 23		Sheet: 1 of 4	Series 337 / Sheet 245
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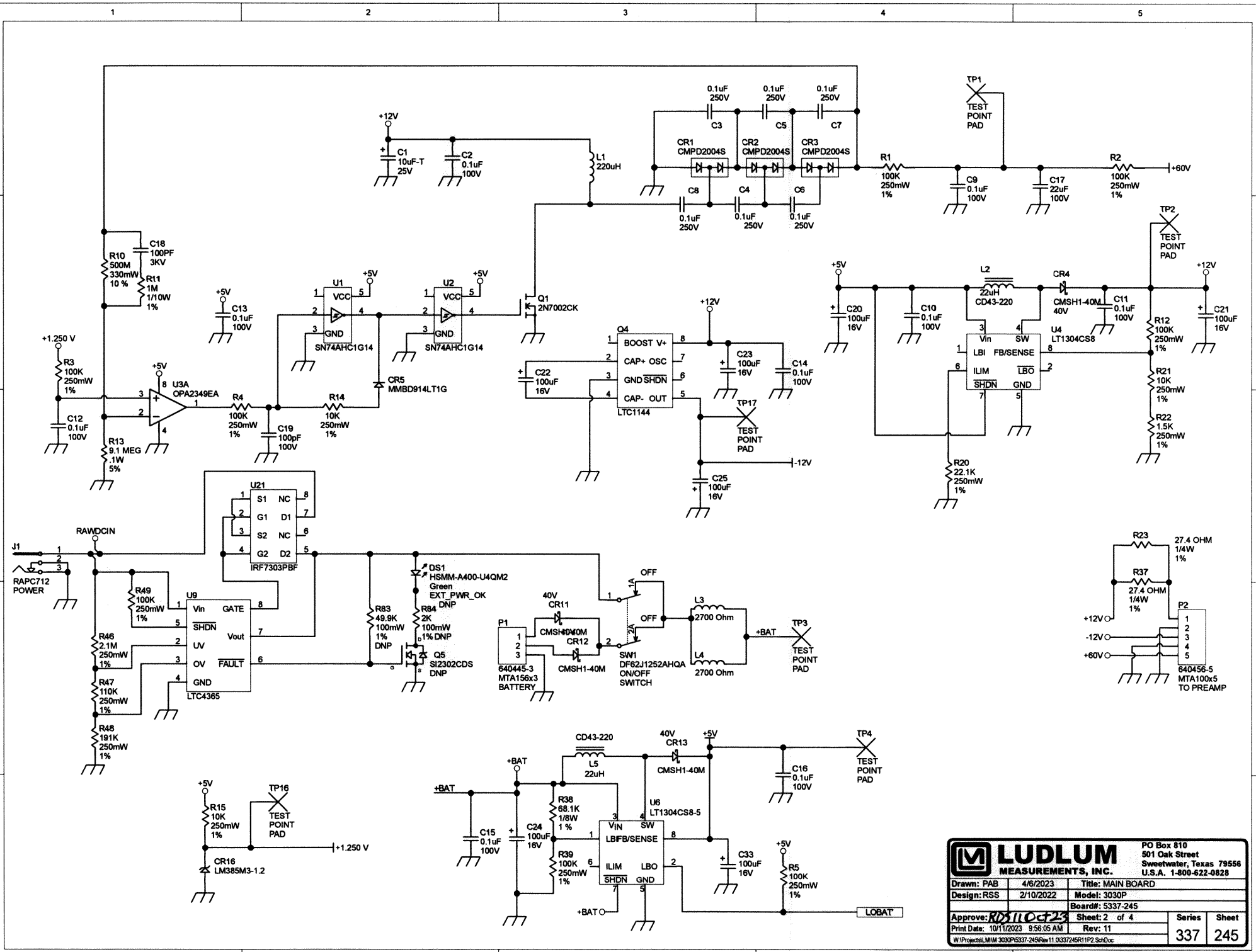
+12V
C1 10uF-T 25V
C2 0.1uF 100V
L1 220uH
0.1uF 250V
C3
C5
C7
CR1 CMPD2004S
CR2 CMPD2004S
CR3 CMPD2004S
C8
C4
C6
R1 100K 250mW 1%
TP1 TEST POINT PAD
C9 0.1uF 100V
C17 22uF 100V
R2 100K 250mW 1%
+60V
R10 500M 330mW 10 %
R11 1M 1/10W 1%
C18 100PF 3KV
+5V
C13 0.1uF 100V
U1 VCC GND SN74AHC1G14
U2 VCC GND SN74AHC1G14
Q1 2N7002CK
CR5 MMBD914LT1G
+1.250 V
R3 100K 250mW 1%
C12 0.1uF 100V
R13 9.1 MEG .1W 5%
U3A OPA2349EA
R4 100K 250mW 1%
C19 100pF 100V
R14 10K 250mW 1%
Q4 BOOST V+ CAP+ OSC GND SHDN CAP- OUT LTC1144
C22 100uF 16V
C23 100uF 16V
C14 0.1uF 100V
TP17 TEST POINT PAD
-12V
C25 100uF 16V
+12V
+5V
C20 100uF 16V
C10 0.1uF 100V
L2 22uH CD43-220
CR4 CMSH1-40M 40V
C11 0.1uF 100V
U4 LT1304CS8 Vin SW LBI FB/SENSE ILIM LBO SHDN GND
TP2 TEST POINT PAD
+12V
C21 100uF 16V
R12 100K 250mW 1%
R21 10K 250mW 1%
R22 1.5K 250mW 1%
R20 22.1K 250mW 1%
U21 S1 NC G1 D1 S2 NC G2 D2 IRF7303PBF
RAWDCIN
J1
RAPC712 POWER
R49 100K 250mW 1%
U9 Vin GATE SHDN Vout UV FAULT OV GND LTC4365
R46 2.1M 250mW 1%
R47 110K 250mW 1%
R48 191K 250mW 1%
R83 49.9K 100mW 1% DNP
DS1 HSMM-A400-U4QM2 Green EXT_PWR_OK DNP
R84 2K 100mW 1% DNP
Q5 SI2302CDS DNP
P1 640445-3 MTA156x3 BATTERY
40V CR11 CMSH1-40M
CR12 CMSH1-40M
OFF
OFF
SW1 DF62J1252AHQA ON/OFF SWITCH
L3 2700 Ohm
L4 2700 Ohm
+BAT
TP3 TEST POINT PAD
R23 27.4 OHM 1/4W 1%
R37 27.4 OHM 1/4W 1%
P2 640456-5 MTA100x5 TO PREAMP
+12V
-12V
+60V
+5V
TP16 TEST POINT PAD
R15 10K 250mW 1%
CR16 LM385M3-1.2
+1.250 V
CD43-220
L5 22uH
40V CR13
CMSH1-40M
TP4 TEST POINT PAD
C16 0.1uF 100V
+BAT
C15 0.1uF 100V
C24 100uF 16V
R38 68.1K 1/8W 1 %
R39 100K 250mW 1%
U6 LT1304CS8-5 VIN SW LBI FB/SENSE ILIM LBO SHDN GND
C33 100uF 16V
R5 100K 250mW 1%
LOBAT
LUDLUM MEASUREMENTS, INC.
PO Box 810
501 Oak Street
Sweetwater, Texas 79556
U.S.A. 1-800-622-0828
Drawn: PAB 4/6/2023
Design: RSS 2/10/2022
Title: MAIN BOARD
Model: 3030P
Board#: 5337-245
Approve: RDS 11 Oct 23
Sheet: 2 of 4
Print Date: 10/11/2023 9:56:05 AM
Rev: 11
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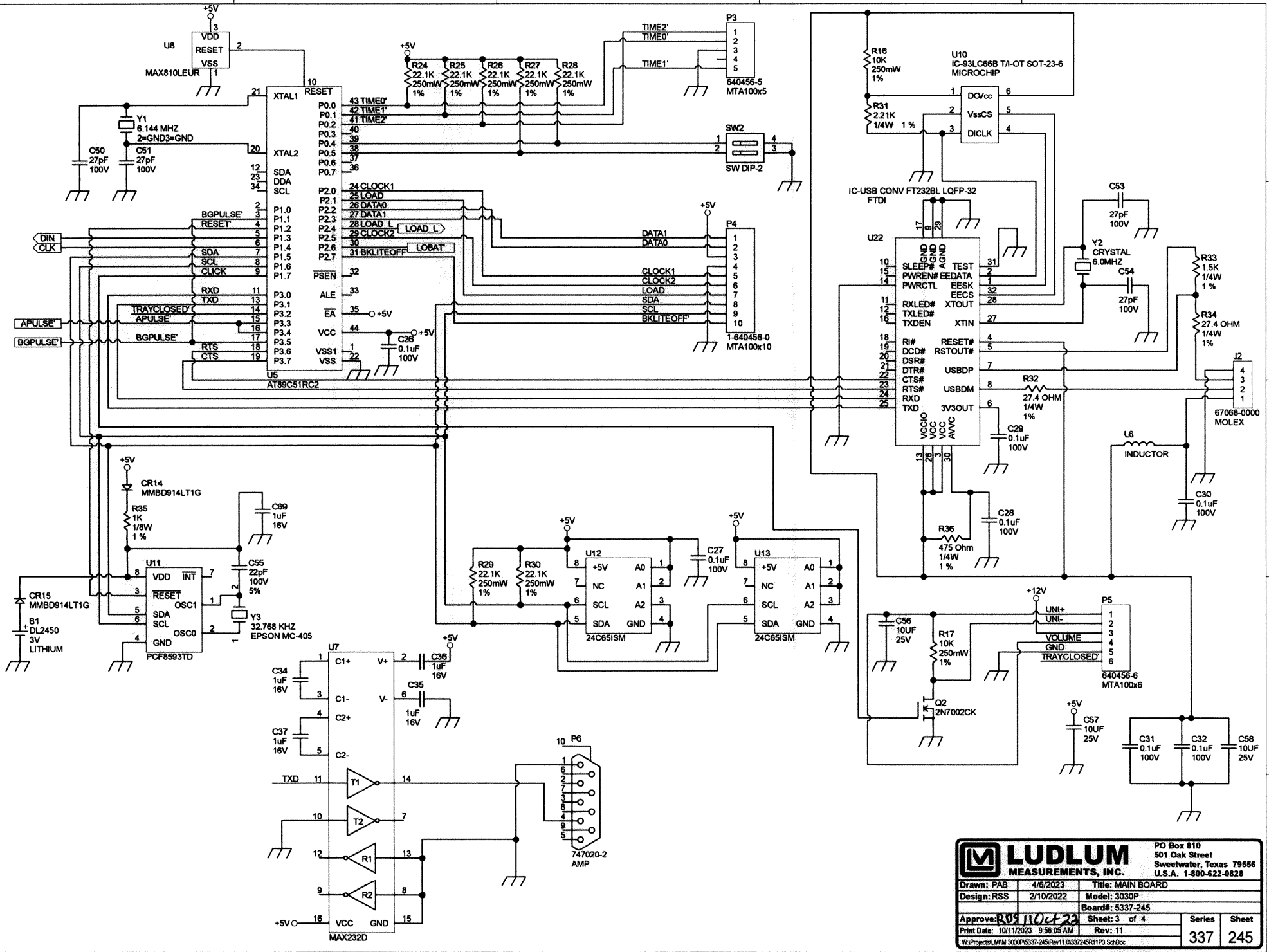
Series 337
Sheet 245


U8
MAX810LEUR
Y1
6.144 MHZ
2=GND3=GND
C50
27pF
100V
C51
27pF
100V
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AT89C51RC2
P3
640456-5
MTA100x5
SW2
SW DIP-2
P4
1-640456-0
MTA100x10
C26
0.1uF
100V
U10
IC-93LC66B T/I-OT SOT-23-6
MICROCHIP
R16
10K
250mW
1%
R31
2.21K
1/4W 1 %
IC-USB CONV FT232BL LQFP-32
FTDI
U22
Y2
CRYSTAL
6.0MHZ
C53
27pF
100V
C54
27pF
100V
R33
1.5K
1/4W
1 %
R34
27.4 OHM
1/4W
1%
J2
67068-0000
MOLEX
R32
27.4 OHM
1/4W
1%
C29
0.1uF
100V
L6
INDUCTOR
C30
0.1uF
100V
C28
0.1uF
100V
R36
475 Ohm
1/4W
1 %
CR14
MMBD914LT1G
R35
1K
1/8W
1 %
C89
1uF
16V
U11
PCF8593TD
C55
22pF
100V
5%
Y3
32.768 KHZ
EPSON MC-405
CR15
MMBD914LT1G
B1
DL2450
3V
LITHIUM
U12
24C65ISM
U13
24C65ISM
R29
22.1K
250mW
1%
R30
22.1K
250mW
1%
C27
0.1uF
100V
U7
MAX232D
C34
1uF
16V
C35
1uF
16V
C36
1uF
16V
C37
1uF
16V
P6
747020-2
AMP
C56
10UF
25V
R17
10K
250mW
1%
Q2
2N7002CK
P5
640456-6
MTA100x6
C57
10UF
25V
C31
0.1uF
100V
C32
0.1uF
100V
C58
10UF
25V
LUDLUM
MEASUREMENTS, INC.
PO Box 810
501 Oak Street
Sweetwater, Texas 79556
U.S.A. 1-800-622-0828
Drawn: PAB
4/6/2023
Title: MAIN BOARD
Design: RSS
2/10/2022
Model: 3030P
Board#: 5337-245
Approved: RDS 11Oct23
Sheet: 3 of 4
Series
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Sheet
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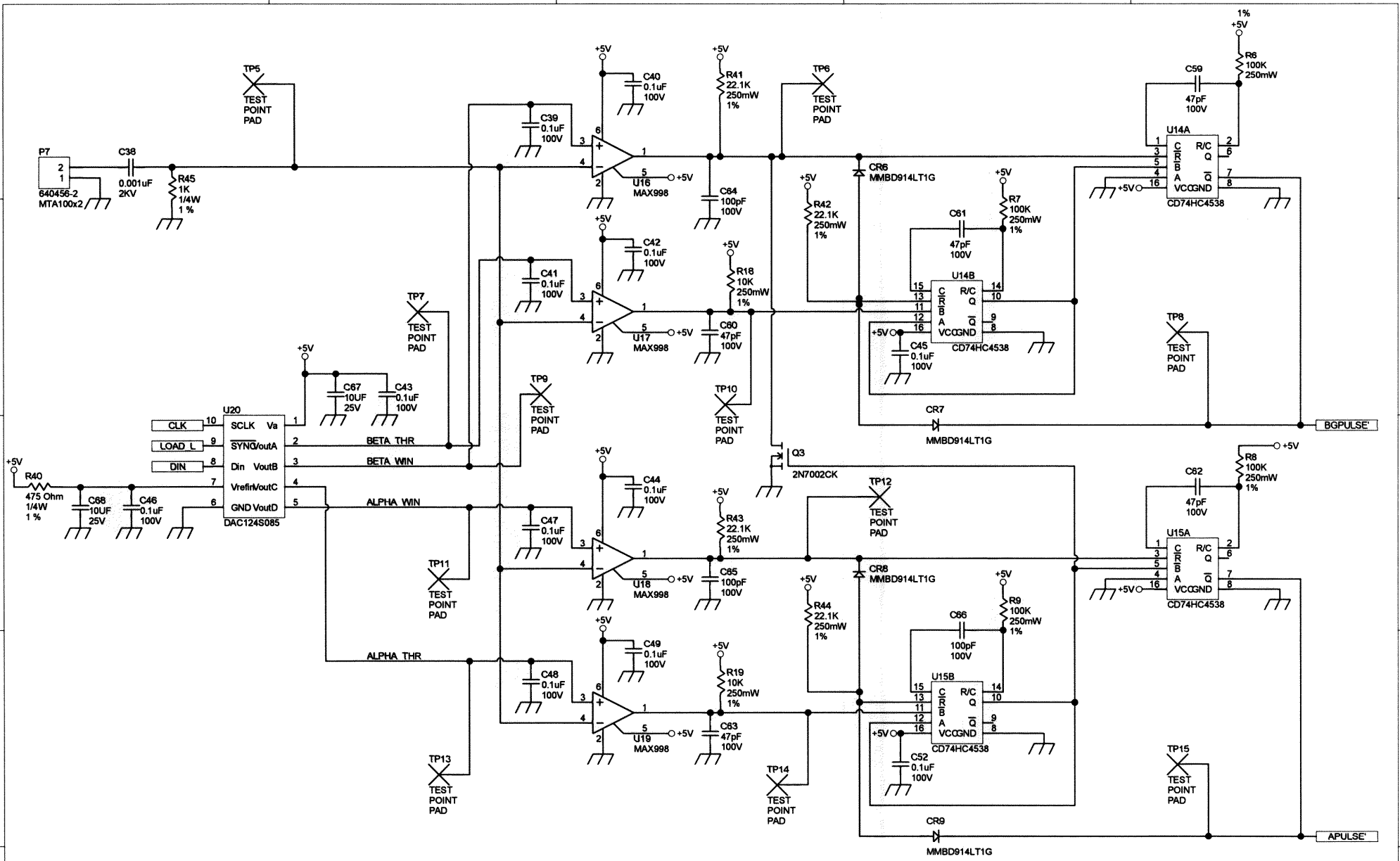

LUDLUM MEASUREMENTS, INC.		PO Box 810 501 Oak Street Sweetwater, Texas 79556 U.S.A. 1-800-622-0828	
Drawn: PAB	4/6/2023	Title: MAIN BOARD	
Design: RSS	2/10/2022	Model: 3030P	
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Approve:		Sheet: 4 of 4	Series 337 / Sheet 245
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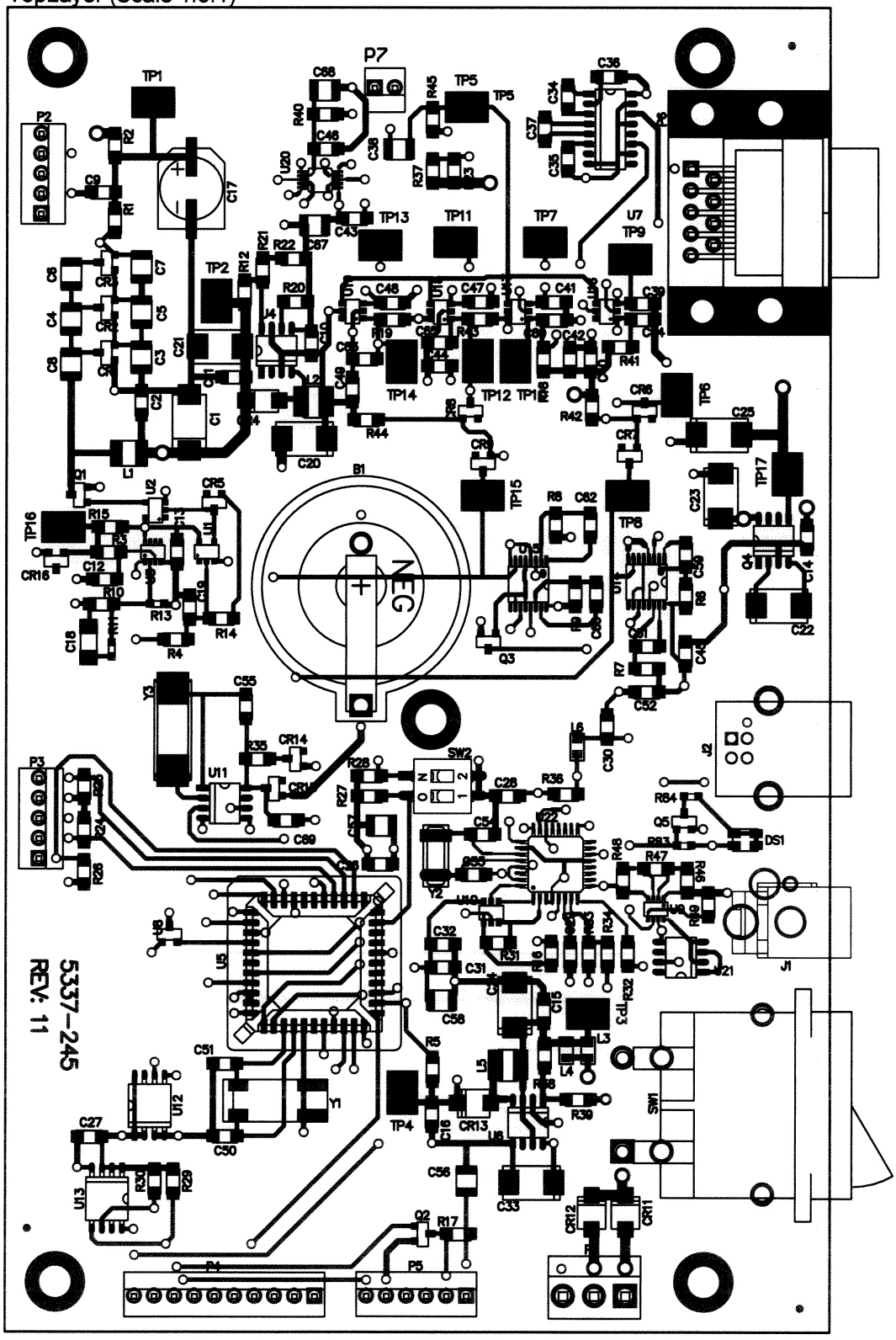

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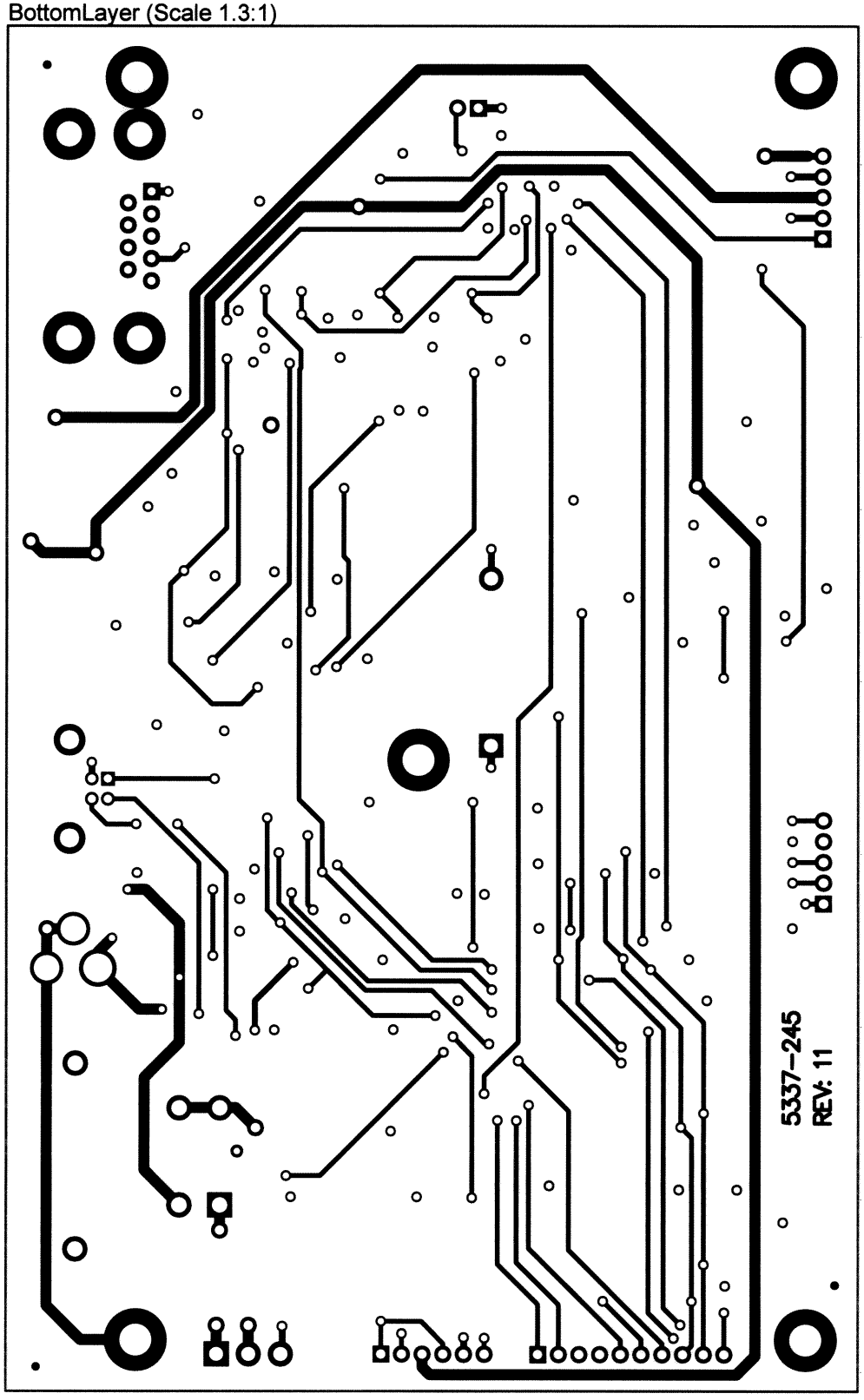

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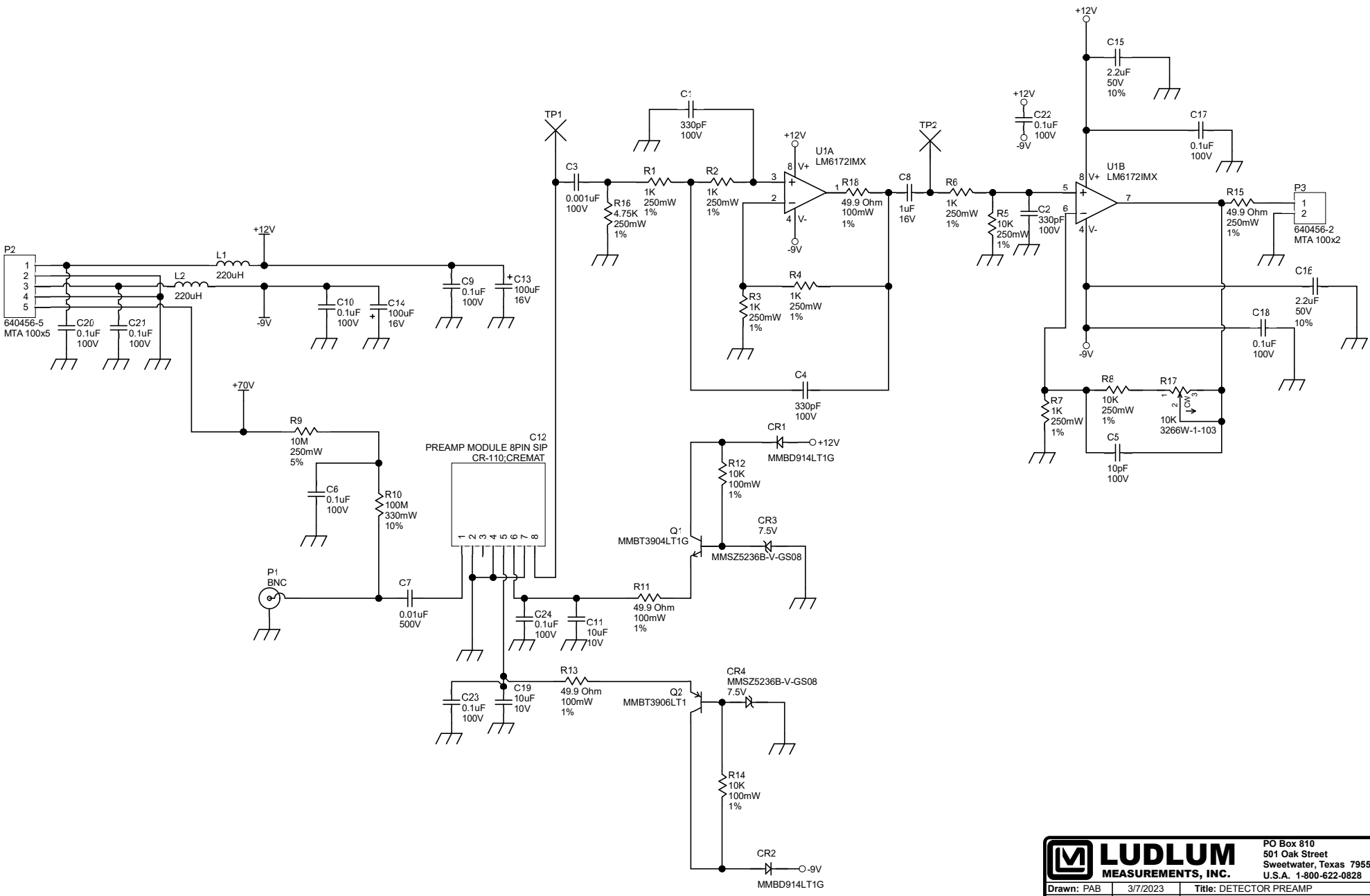

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Sweetwater, Texas 79556
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Drawn: PAB	3/7/2023	Title: DETECTOR PREAMP	
Design: RDS	10/26/2020	Model: 3030P	
		Board#: 5337-355	
Approve: JMC	3/8/2024	Sheet: 1 of 1	Series 337 / Sheet 335
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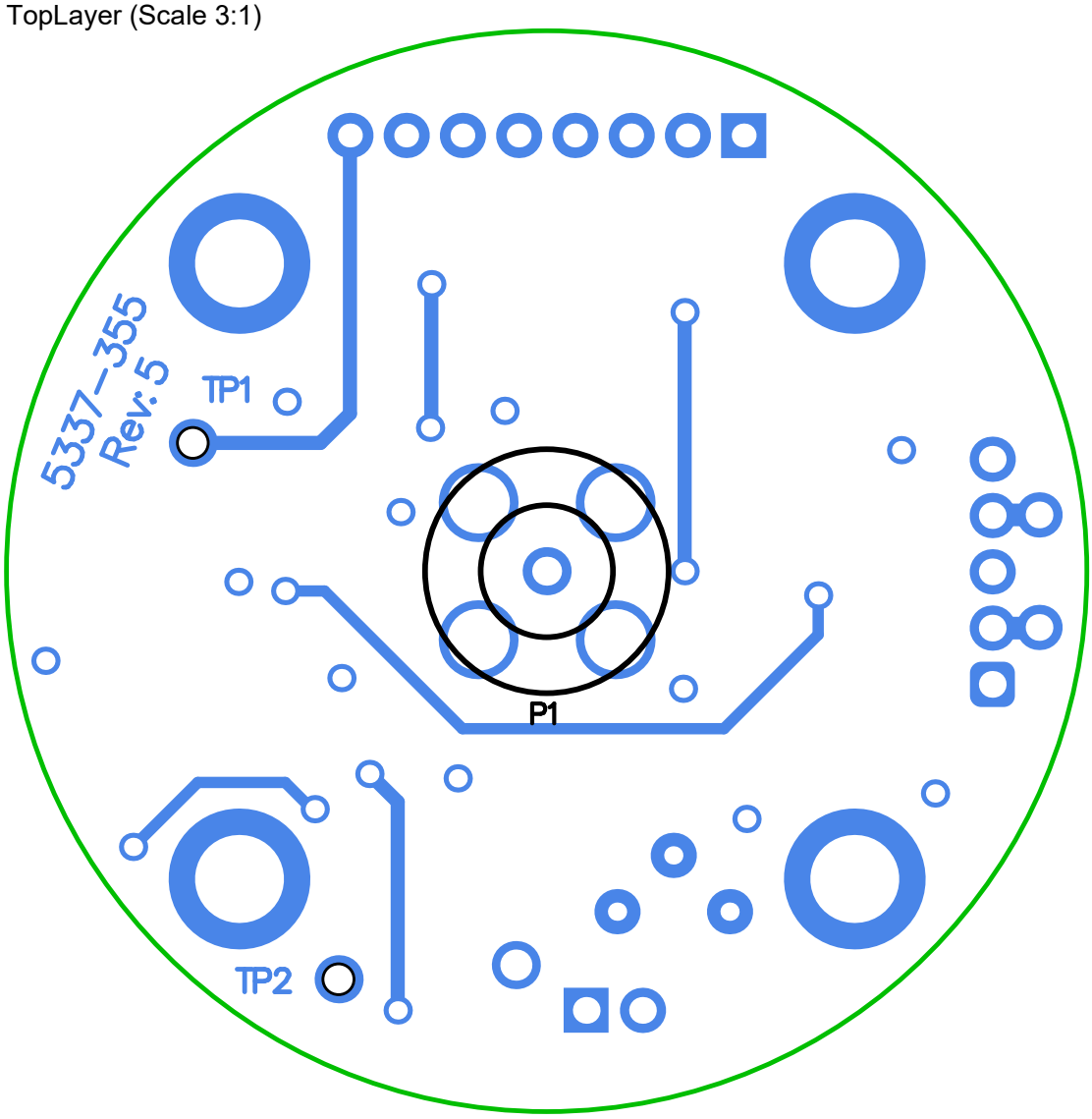

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Design: RDS	**Date:** 10/26/2020		**Rev:**	5
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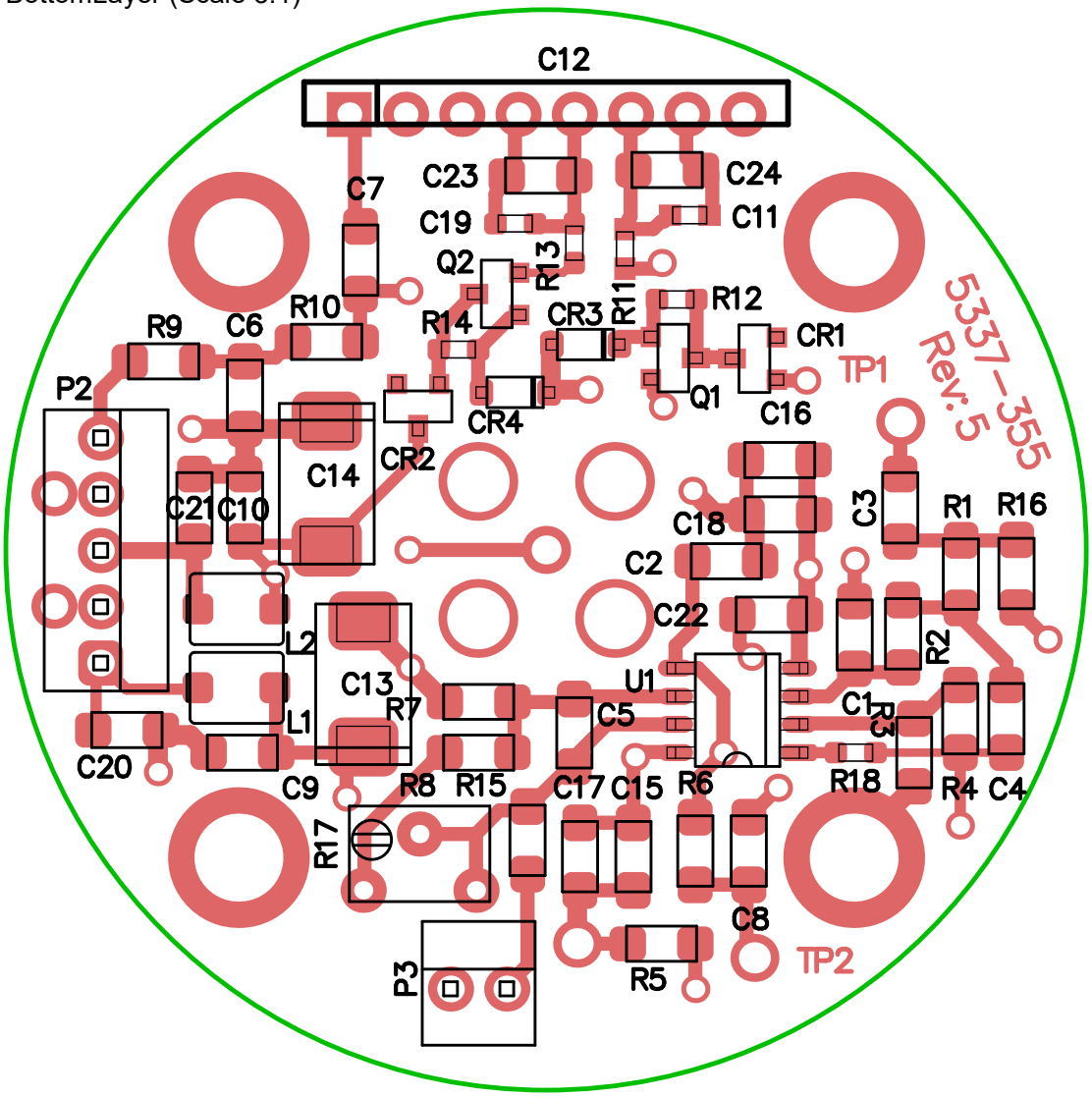

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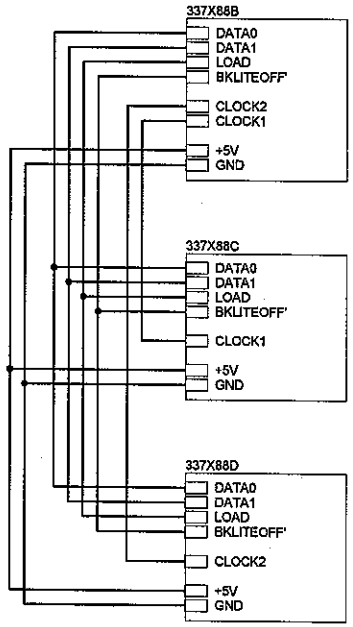

LUDLUM MEASUREMENTS, INC.
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501 Oak Street
Sweetwater, Texas 79556
U.S.A. 1-800-622-0828

Drawn: JK	28-FEB-01	Title: DISPLAY BOARD	
Design: RSS	28-FEB-01	Model: M3030	
Check:		Board#: 5337-084	
Approve:		Sheet: 1 of 4	Series 337 / Sheet 88
11:18:46	19-Jun-2009	Rev: 1.0	

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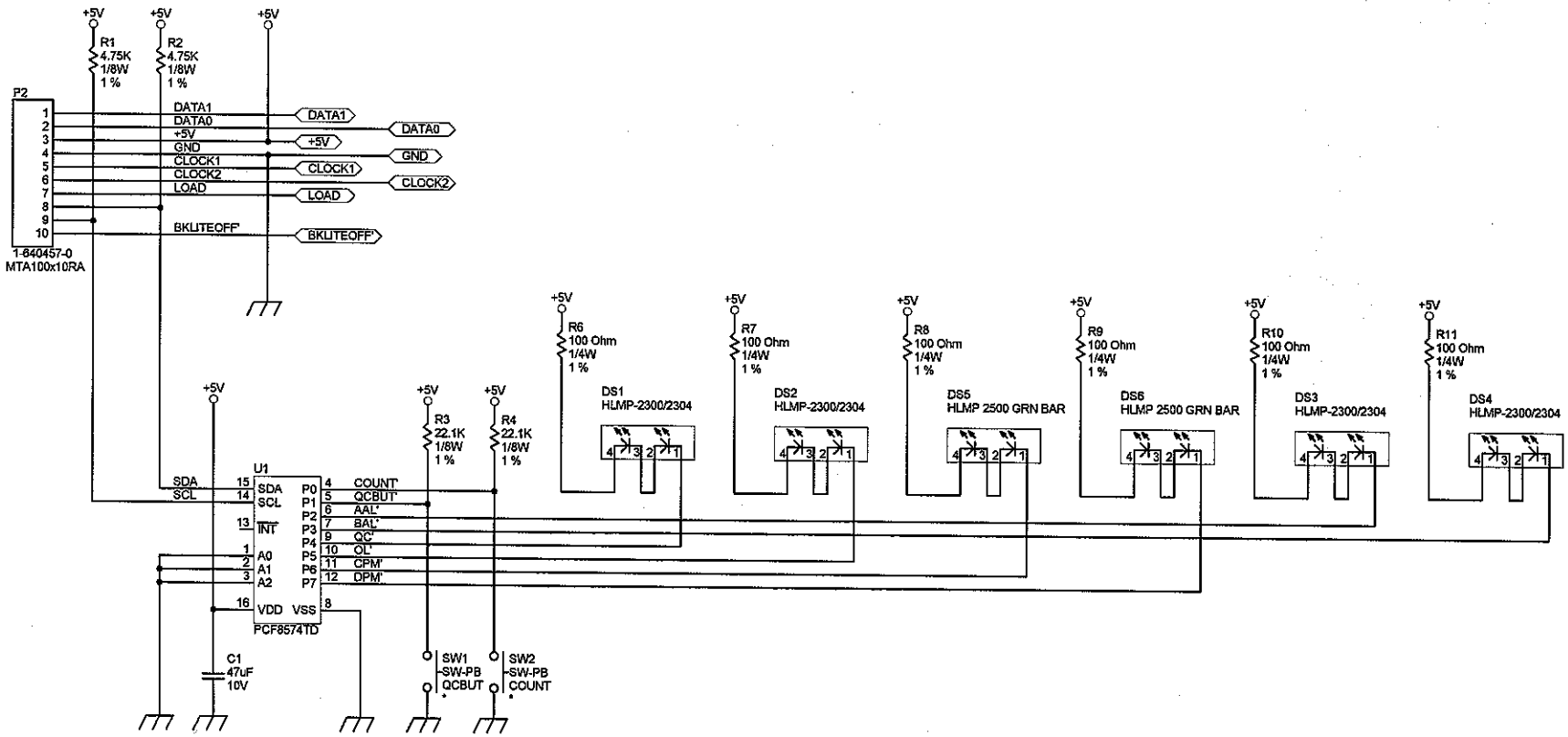

LUDLUM MEASUREMENTS, INC.		PO Box 810 501 Oak Street Sweetwater, Texas 79556 U.S.A. 1-800-622-0828	
Drawn: JK	28-FEB-01	Title: DISPLAY BOARD	
Design: RSS	28-FEB-01	Model: M3030	
Check:		Board#: 5337-084	
Approve:		Sheet: 2 of 4	Series 337 / Sheet 88
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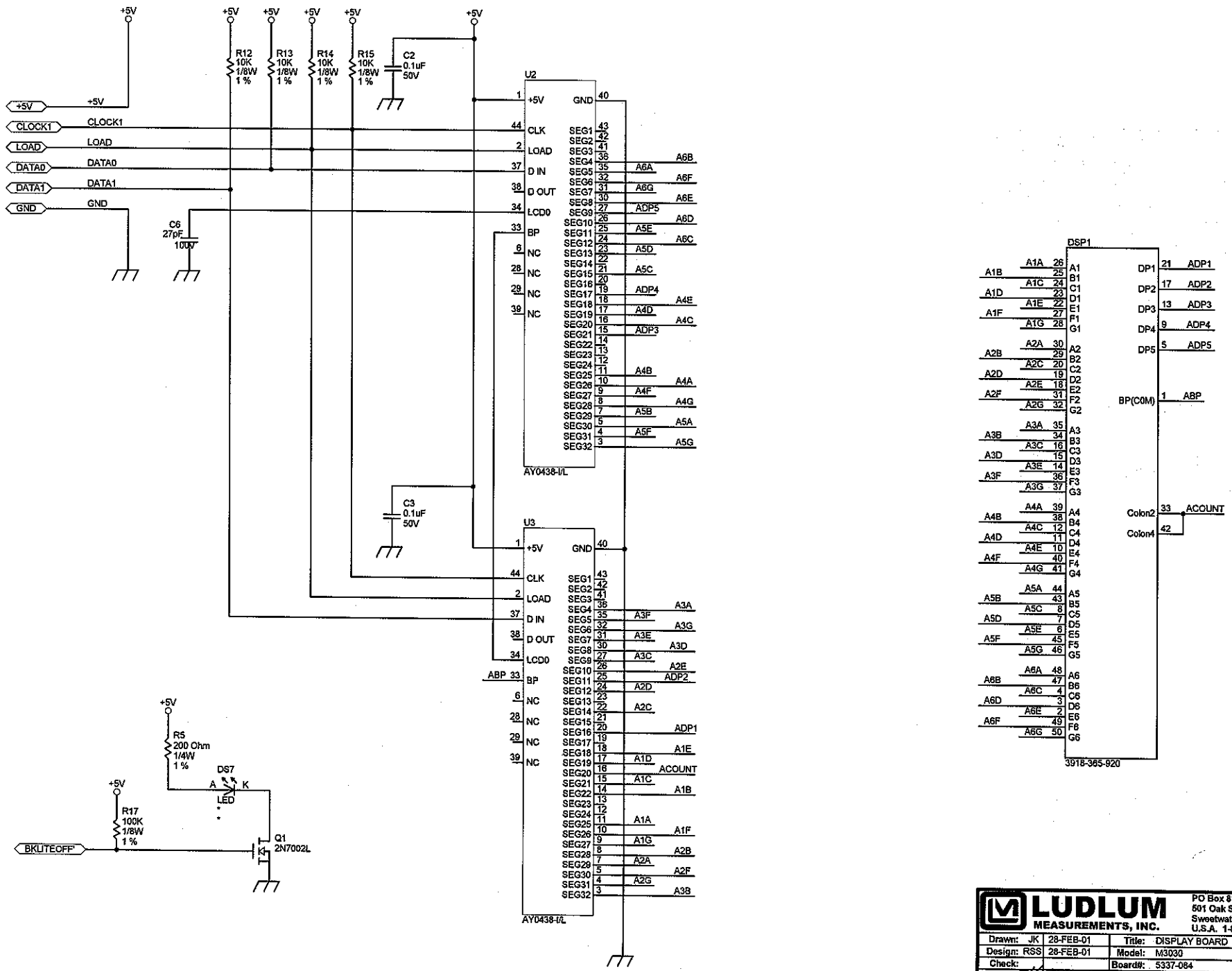

LUDLUM MEASUREMENTS, INC.		PO Box 810 501 Oak Street Sweetwater, Texas 79556 U.S.A. 1-800-622-0828	
Drawn: JK	28-FEB-01	Title: DISPLAY BOARD	
Design: RSS	28-FEB-01	Model: M3030	
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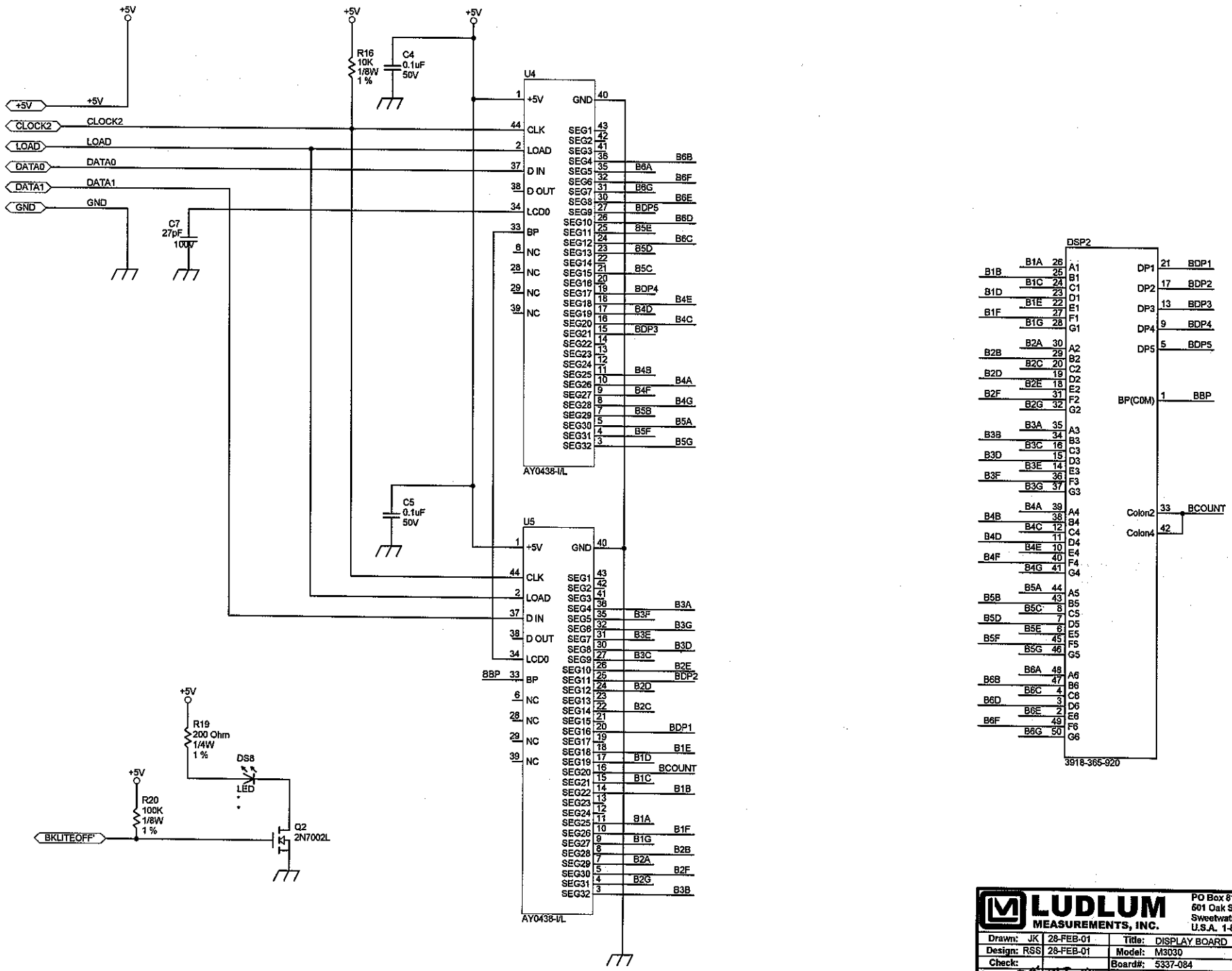

LUDLUM MEASUREMENTS, INC.	PO Box 810 501 Oak Street Sweetwater, Texas 79556 U.S.A. 1-800-622-0828
Drawn: JK 28-FEB-01	Title: DISPLAY BOARD
Design: RSS 28-FEB-01	Model: M3030
Check:	Board#: 5337-084
Approve: 17 March 09	Sheet: 4 of 4
11:18:36 19-Jun-2009	Rev: 1.0
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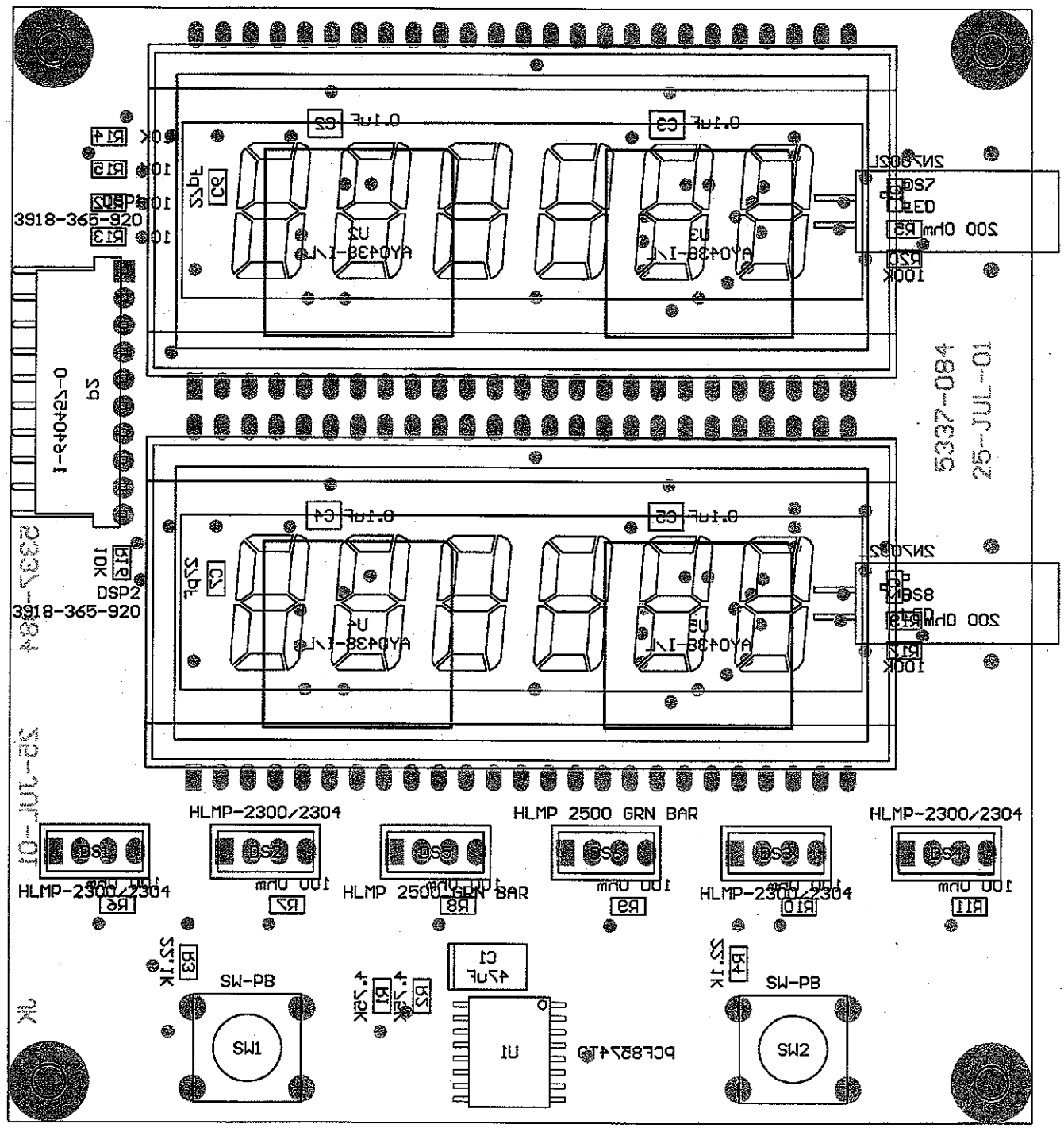

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Approve: RSS	6 Feb 09	Board#: 5337–084			
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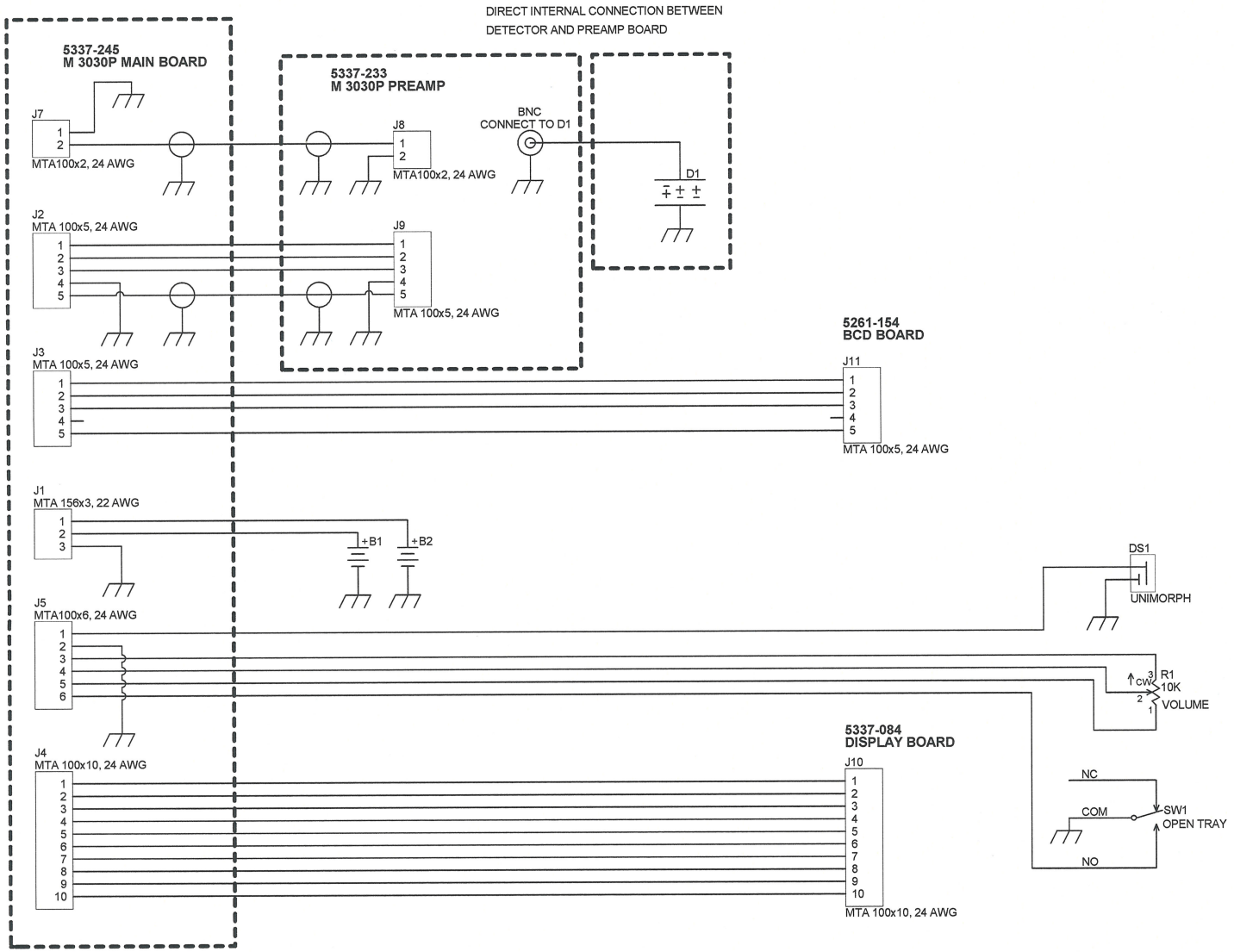

LUDLUM MEASUREMENTS, INC.		PO Box 810 501 Oak Street Sweetwater, Texas 79556 U.S.A. 1-800-622-0828	
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Design: SD	04/01/2013	**Model:** 3030P	
		Board#: 337-5354	
Approve:		**Sheet:** 1 of 1	**Series** 337 / **Sheet** 354
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