

# OWNERS MANUAL

MANUAL NO. 01

REV. DATE: 1/2026

## The ZEN TORII MONOS V3



MODEL  
ZTMV3

 **DECWARE**

# OWNERS MANUAL

## QUICK START GUIDE - CHECKLIST

### Make sure you have the following items for each channel

- Amplifier
- PowerCord
- 2 of the larger KT88 output tubes (8 pin)
- 2 of the smaller 6N1P or 6922 input tubes (9 pin)

### 1) Install the tubes into the amplifier.

Note: The large 8 pin tubes have a plastic center guide pin that fits into a notched keyway in the socket. It is important to figure out before installing the tube what the proper alignment should be. Once you get it to line up properly, the tube can be gently pushed into the socket until it seats. During both installation and removal it is important to install and remove the tubes in a straight in-and-out fashion with as little rocking as possible.

The smaller 9 pin tubes are easier to see how to align and are plugged straight into the socket and removed by pulling straight out. These too should not be excessively rocked or tipped as it can damage the pins or even the socket. On 9 pin tubes it is important to visually inspect the pins to be sure they are straight. Since the pins are smaller in diameter they are easy to bend and are often slightly bent from handling. These pins can be carefully straightened by hand or you can purchase a tube pin straightener from most tube suppliers that makes the task quick and simple. Installing 9 pin tubes with pins that are not straight will damage the socket of the amplifier, an item not easily replaced since the main circuitry is directly soldered to the socket pins.

Another note about tubes and straight pins is this: Many tubes, being blown glass and assembled by hand, are not perfectly straight relative to the base of the tube and or tube pins. It is common for some tubes to be slightly crooked. This has nothing to do with how straight the pins of the tube are and should be treated as a separate issue which is purely cosmetic.

The ideal way to clean tube pins is with a pencil eraser, and it's a good idea to clean even new tubes prior to plugging them into your amp.

It is acceptable to use FINITE amounts (perhaps 1 drop for all 8 or 9 pins) of "Caig DeOxit" products to further clean and lubricate the tube sockets. Apply product to tube pins only. A small amount of this has already been applied at the factory and should last at least a year.

# OWNERS MANUAL

## Tube Locations

As you can see in the picture below, the two larger tubes go into the 8 pin sockets. The tubes should be matched and it makes no difference which one goes on what side.

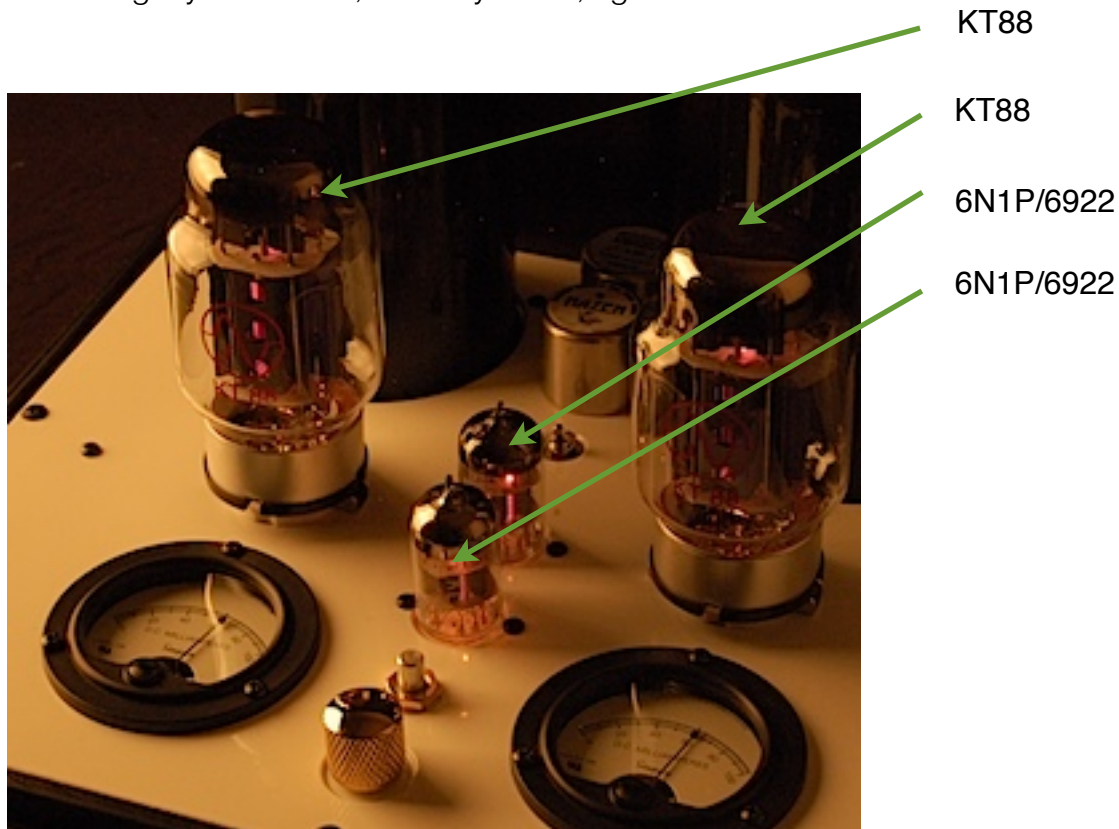
The two smaller 9 pin tubes are of the same type. They are either 6N1P or 6922, often supplied in matched pairs, meaning both tubes are of the same type. If this is the case, then it makes no difference which tube goes in the front or the back position.

If you plan to get creative and try mixing it up a bit, by installing one of each, the front tube is likely to have the biggest impact on the sound. The rear tube is what we call a follower so it adds no gain to the signal, just a lot of torque. Often we see users placing a 6922 in the front location and a 6N1P in the rear location but reversing it changes the sound too.

The sound of these interchangeable tubes are as follows:

6N1P - warmest, smoothest, most forgiving

6922 - slightly less warm, more dynamic, tighter focus



# OWNERS MANUAL

## 2) Install Power Cord

Each amplifier has a high quality IEC connector. This is an overlooked item on most amplifiers and are typically made in China with inferior plastics, metals, and feature poor electrical connections and earth grounds that change with tension, and temperature. This includes the gold plated ones being sold to unknowing audiophiles at an inflated price. Our power cord connector, being quite the opposite, is fully worthy of an expensive power cord.

Note: Having the power cord go straight up and then curve straight down, relieves the leverage on the contacts inside the power cord which in turn prevents it from prematurely wearing out.

### Fuse

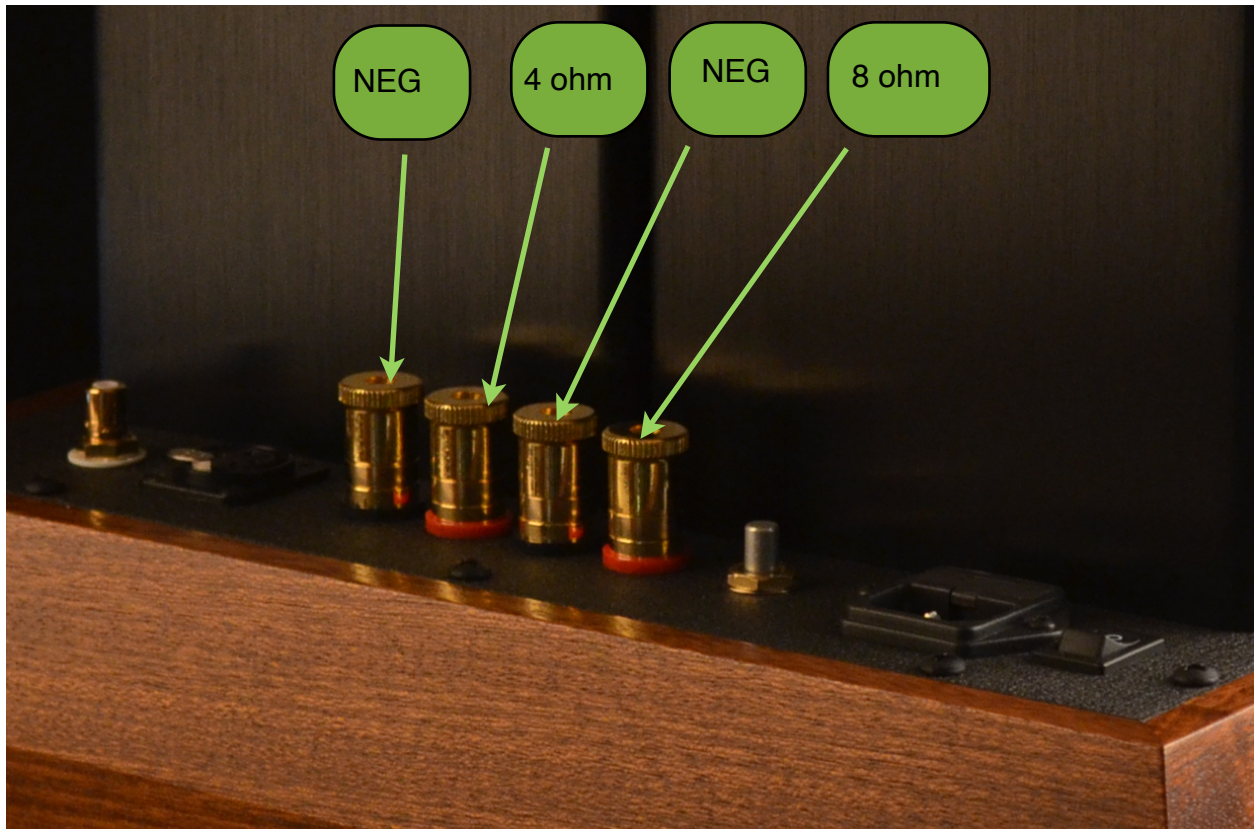
The IEC connector where the power cord plugs into has a concealed door that can be pried open to reveal the fuse holder. Inside it there is also a spare fuse. The fuse should be a 20x5mm with a maximum rating of 5 amps. If you have a 240VAC model your fuse should be 2.5 amps. Fast Blow types are recommended.



# OWNERS MANUAL

## Power Draw

Each Zen TORII Mono amplifier will draw between 1.2 and 1.6 amps from the wall outlet. (150 ~175 watts) The actual amount depends on how high the tubes are biased, as higher biased tubes draw more current.



## 3) Speaker Connections

There are 4 binding posts located at the rear of each amplifier for hooking up your speakers. The bottom of these jacks are color coded. **There is a black and red pair for 4 ohm speakers and a black and red pair for 8 ohm speakers.** While the black binding posts are for the negative speaker wire and are connected together internally, the red positive binding posts are not. They are not intended to be used at the same time.

These are industry standard 5 way binding posts that accept bare wire up to 8 AWG, spade connectors or banana jacks.

**MAKE SURE A LOUDSPEAKER IS CONNECTED TO THE AMPLIFIER AT ALL TIMES. DO NOT OPERATE THE AMPLIFIER WITHOUT A WORKING LOUDSPEAKER**

# OWNERS MANUAL

## STARTING YOUR AMPLIFIER FOR THE FIRST TIME

Once you have the tubes installed and the power cord plugged in, the volume control all the way down (counter-clockwise) you are almost ready to turn it on. BEFORE YOU DO, we need to familiarize you with the BIAS controls. There are only two and they are extremely easy to operate. (***after the amplifier is turned on and properly biased, we will connect your source component.***)

We'll start with the most important of the two controls, the one in the front of amplifier located between the two meters. It is a small 1/4 inch shaft with no knob on it. The knob is not used because this control is seldom adjusted, and a knob makes it easier to accidentally bump it out of adjustment. **This control** is called the **BIAS BALANCE KNOB** and it is simply used to make the two meters read the same value.



In the picture above you can see the meter on the left is for the KT88 output tube directly behind it. Same for the meter on the right. These meters show how many milliamps of current are going through each output tube. Since this is a push-pull amplifier, the objective is to get both tubes to draw the same amount of current so that they match. This gives the best performance and the most power.

# OWNERS MANUAL

## HOW TO USE THE BIAS BALANCE KNOB

Approximately 30 to 40 seconds after the power switch has been turned on, the heaters inside the output tubes (part that glows) will begin to emit electrons and current will begin to flow. You will want to watch this happen in real time by keeping your eyes on the meters and watching them climb and seeing if the both stop at the same number.

After the tubes heat up the meters will show how many milliamps of current each tube is adjusted to. If they don't match, simply adjust the control until they do. If you turn the control the wrong way, the difference between the two meters will increase suggesting that you turn the control the opposite direction until they match.

As the tubes heat up during the first 15 to 30 minutes, you'll see the current draw of each tube drift a bit. This is normal and requires only another fine adjustment to get the tubes balanced and then expect them to stay that way until you turn the amplifier off. When you turn it on again for your next listening session, you'll find the tubes will bias up right where you had them set once they have fully warmed up. Of course you can make fine adjustments at any time, and if music is playing, just turn the volume control all the way down to make your adjustment.

Later on you will notice that music effects the meters at higher volume levels. In fact the meters can dance pretty readily when the amplifier is at it's maximum 60 watt output level on musical peaks. That means you can visually SEE when your amp is - running out of power and starting to distort. Keeping your amp from making the meters move excessively (more than 20 mills) ensures long life for your output tubes, speakers and your hearing.



Now that your amp is on and the meters read the same value on each side, lets learn how to adjust what that value is.

In the picture, the amp is set to 60 mills per side. This is an ideal operating point. You can run it at 70 mills per side which tends to add weight to the sound but you may think is sounds better at 60 mills. There is no right or wrong setting, just trust your ears.

# OWNERS MANUAL

After the bias meters are balanced, you can raise or lower the value of them both at the same time without losing the balance between them via this control next to the power cord at the rear of the amplifier.



The range of this control varies with output tubes. The ideal operating point for KT88's in this amplifier would be between 60 and 70 milliamps. 80 milliamps should be considered the absolute maximum. Running any higher will sacrifice headroom and create more heat.

This control may be operated while music is playing at normal listening levels or below. It is common to set this control every time you change output tubes.

**NOTE:** *This amp is not compatible with KT90's or higher unless they will bias at 80mA or less.*

# OWNERS MANUAL

## Summary of quick start up

You're going to hook up your speakers, properly install the tubes and power cord, plug the amplifier in, turn the volume control all the way down, and turn on the amp.

You'll watch the bias meters as the tubes start to glow and within a minute or less you'll see them register the current of each output tube. Adjust the control so they match.

## NOISE Check

At this point, the amp is on with a speaker hooked to it and the volume is turned all the way down. This is called "idle" and you should hear no sound from your speakers. No hum, no hiss, no noise that would be detectable from the listening chair. To hear anything at all you should have to put your head around 6 to 12 inches away from the speaker.

**Source hookup** - it is important from this stage forward to pay attention to the residual noise floor that we have established in the noise check above. If it increases in any way as we hook up the source component(s) then we know the cables or source components are the cause.

The next step is to hook up your source, and this can be done with the amplifier on or off, but in both cases, the volume control on the amplifier should always be turned down as far as it will go while you are hooking up the source cables.

If you have balanced sources then use the balanced XLR input jack, if not, then use the RCA unbalanced input jack. Once connected, with your source paused, you can slowly raise the volume control and check for noise. If everything seems satisfactory, then return the volume control the off position, and un-pause your source and slowly raise the volume to the desired level.

# OWNERS MANUAL

## SOURCES - Balanced and Unbalanced



The Zen TORII Mono's feature a fully balanced XLR input jack and one single-ended (unbalanced) RCA input jack.

The XLR jack is in parallel with the RCA. This means you can use one or the other but not both at the same time. The XLR input uses a very high quality transformer that converts XLR to RCA but with XLR voltage. So when an XLR input is used, the RCA becomes an output which could be used to send an RCA signal to another amplifier.

This could be done in a bi-amp setup where you have one mono-block fed by a balanced XLR source, feeding a second mono-block fed by an RCA source.

# OWNERS MANUAL

## Preamps

If you plan to use a preamp, you will end up with basically a volume control on the preamp and a gain control on the amplifier. This is a huge advantage over having an amplifier without a gain control. You'll want to experiment with where best to set the gain control on the amplifier. Start with it set all the way up - same thing as not having a gain control. Then experiment with turning the gain control down and the volume control on the preamp up to compensate. You'll find this adjustment can have a big affect on the sound. Just go with what works and sounds best to you.

Remember, the audio chain can be no more transparent than the weakest link in the chain... sometimes this can be a preamp. The way to tell is to listen to the amps with and without a preamp and see if there is a detectible veil over the music when the preamp is used.

## OUTPUT TUBE MATCHING TIPS

The meters on this amplifier can be used to see tubes age and monitor their performance. If you find that you have to adjust the bias balance control almost all the way to one side to achieve balance that means that the tubes no longer match in so much as one has become weaker in output than the other. This would be a good time to replace the tubes.

Don't be fooled! The input tube (small 9 pin tube closest to the front of the amplifier) is of critical importance to the matching of the output tubes. It too must be reasonably well matched from side to side (the small tubes actually have two sections inside them whereas the large output tubes have only one section inside).

If you find yourself having unexplained trouble getting matched output tubes to match, or the meters dance wildly when music is played it is an indication that the front input tube should be replaced. Once replaced, the output tubes may balance up fine.

# OWNERS MANUAL

## OPERATION

If you've been going through this manual (highly highly recommended) and reached this point, we know you're already listening to music and we'll probably never see you again... but a few additional notes...

## TYPE OF AMP

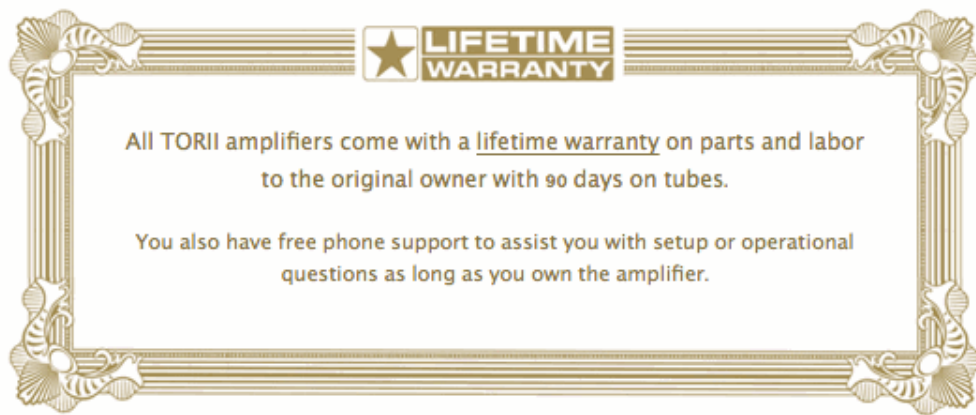
Your Class A amplifiers are a push-pull design with an adjustable fixed bias using ultra-linear output transformers with multiple taps for different loudspeakers. It is a design with the fewest internal parts of any push pull amplifier featuring direct coupled stages for maximum transparency and minimal phase angle.

## SAFETY

Your amplifiers are fused, however with all devices that generate heat it is not recommended to leave the amplifier on when you are not at home, or during the night when you are sleeping. There are no internal user serviceable parts inside this amplifier.

## OPTIONS

Your amplifier comes with a pair of Jensen JT11P1 balancing transformers to cover most applications, however, any of the balancing transformers Jensen makes can be requested for custom applications in recording studio environments.



# OWNERS MANUAL

## SPECIFICATIONS

- 120/240 volt 50/60Hz
- OPERATION: CLASS A1
- INPUT TUBE CHOICES: 6922, 6N1P
- OUTPUT TUBE CHOICES: EL34 6CA7 KT77 6550 KT88
- INPUTS: 2 BALANCED XLR INPUT JACKS FOR EACH CHANNEL - SELECTABLE
- INPUTS: 1 UNBALANCED RCA INPUT JACK
- OUTPUTS: 1 PAIR HEAVY GOLD 3 WAY BINDING POSTS PER CHANNEL FOR 4, 8, 16 OHM SPEAKERS
- IDLE CURRENT: 50~90 MILS PER OUTPUT TUBE - ADJUSTABLE
- HIGH B+ VOLTAGE: 510 VDC WITH LOAD
- INPUT IMPEDANCE: 38 K OHMS UNBALANCED 13K BALANCED
- INPUT SENSITIVITY: FULL POWER @ 2.0 VOLTS ON RCA INPUT
- POWER INTO 4 , 8 or 16 OHMS: 58.6 WATTS PER CHANNEL
- NOISE: -90dB
- SILVER CONTACTS on SOURCE SWITCH
- MACHINED OUTPUT SOCKETS WITH MACHINED GOLD CONTACTS
- TOP GRADE SIMPSON CURRENT METERS 0 to 100 MA with JEWELLED MOVEMENT
- WINDOWED BIAS CONTROL to ADJ OUTPUT TUBES
- DYNAMIC BIAS BALANCE CONTROL FOR PERFECT MATCHING of EVEN UNMATCHED TUBES
- 1UF 600V CRYO TREATED FLAT STACKED COPPER FOIL BEES WAX - SIGNAL CAPACITORS
- 20 POS STEPPED ATTENUATOR w/ GOLD CONTACTS for INPUT LEVEL (GAIN) CONTROL
- 4400 UF 500V LABORATORY GRADE POWER SUPPLY CAPS
- TOP GRADE GOLD TEFLON INPUT JACKS
- RECTIFICATION: ULTRA FAST RECOVERY 3 AMP 1000V
- MACHINED ALUMINUM CHASSIS with ANODIZED and POWDER COAT LIFETIME FINISHES
- TOP GRADE FUSED IEC CONNECTOR for REMOVABLE POWER CORD
- SOFT START- NO STANDBY NEEDED
- SHIPS WITH:
- PREMIUM GRADE KT88 OUTPUT TUBES
- PREMIUM GRADE 6N1P INPUT TUBES
- REMOVABLE DHC-1 SILVER TEFLON POWER CORD
- SIZE: 19-1/8 " DEEP x 13-3/4 " WIDE x 8-3/4 " HIGH
- NET WEIGHT: 36.8 lbs.
- WARRANTY: LIFETIME TO ORIGINAL OWNER / 90 DAYS ON TUBES

# OWNERS MANUAL

# Transformers

Transformers

**jensen**

**JT-11P-1**

Bringing Science To Sound

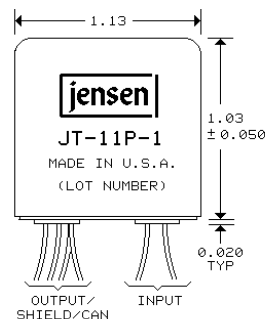
Data Sheet

Jensen

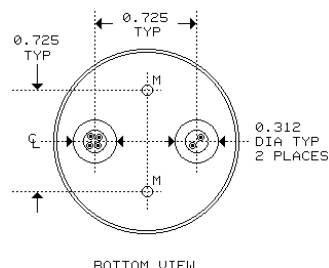
## LINE INPUT TRANSFORMER 1:1 FOR "BALANCED BRIDGING" INPUTS

- Ideal for balancing any high-impedance unbalanced input
- Wide bandwidth: -3 dB at 0.25 Hz and 95 kHz
- Recommended for levels up to +20 dBu at 20 Hz
- High input impedance: 13 kΩ with 10 kΩ load
- High common-mode rejection: 107 dB at 60 Hz

This transformer is designed for use in wideband line input stages. Distortion remains very low and CMRR remains high, even when driven by high source impedances. The primary is fully balanced and its leads may be reversed to invert polarity, if required. A 30 dB magnetic shield package is standard.

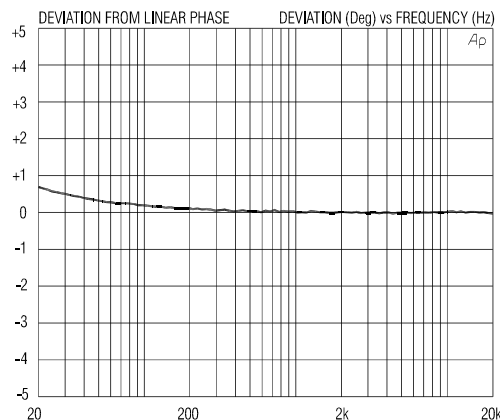
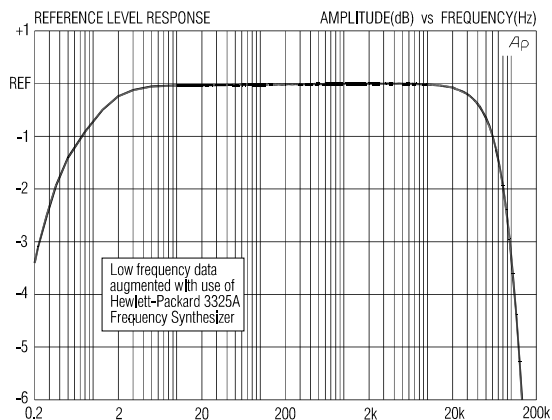
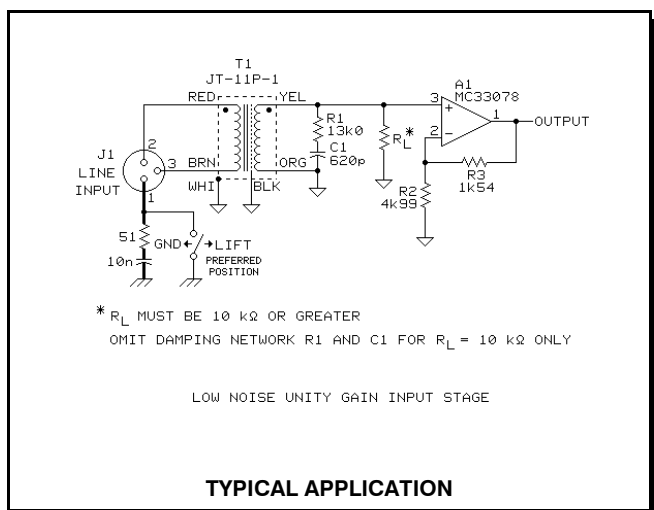


\*#30 AWG (7x38) UL STYLE 1061 COLOR CODED WIRE LEADS, 8" MINIMUM LENGTH



BOTTOM VIEW

USE ONLY #4 TYPE B SELF TAPPING SCREWS IN HOLES "M". ALLOW NO MORE THAN 0.15" PENETRATION INTO TRANSFORMER HOUSING.



# OWNERS MANUAL

## Round Style Analog Panel Meters



- Glass window for optimum viewing
- Rugged black plastic case
- Black spade-type pointer for easy distant reading

### Specifications

**Accuracy:** ±2% F.S. (Iron-Vane), ±3% F.S. (Rectifier)  
**Frequency models:** 45-55Hz ±0.3Hz (120V-240V)  
 55-65Hz ±0.3Hz (120V-240V)  
 380-420Hz ±1.2Hz (120V-240V)

**Wattmeters:** ±2% F.S.; Compensated Meters: ±3% F.S.

**Movement:** Models 55, 155: Iron-vane, magnetically damped  
 Models 45, 145: Annular, rectifier type  
 Models 85 & 185: small core magnet, self-shielding  
 Models 25, 27, 29, 125: Annular, self-shielding

**Tracking:** ±3%  
**Shielding:** Calibration is unaffected by magnetic panel mounting.  
**Response Time:** 1.5 seconds maximum  
**Overload (1 sec.):** 10 times F. S.  
**Overload (Continuous):** 1.5 times F. S.  
**Repeatability:** 2%  
**Dial:** Sharp clear scale. Each dial arc is calibrated to track the specific type of movement used.  
**Case:** High density black plastic  
**Resistance:** ±15%  
**Operating Temp:** -4°F to +149°F (-20°C to +65°C)  
**Pointer:** Models 85 & 185: knife edge, black finish  
 All others: spade pointer with black matte finish

**Scale Length:** Model 155 & 185: 1.6" (40.6mm)  
 Models 125 & 145: 1.8" (45.7mm)  
 Model 55: 2.3" (58.4mm)  
 Models 25, 27, 45 & 85: 2.5" (63.5mm)  
 Model 29: 3.80" (96.5mm)  
**Net Weight:** Models 55, 155 & 185: 5oz (0.14kg)  
 Models 85, 125, 145 & 45: 7oz (0.20kg)  
 Models 25 & 27: 8oz (.23kg)  
 Model 29: 11oz (.31kg)

### Ordering Information

#### AC Microammeters Rectifier Type, Self Shielding Movement

Range	Approx. Impedance (ohms)	Model/Size and Catalog Number	
		3-1/2" Model 45	
0-100	3400	04080	

#### AC Milliammeters, Iron Vane & Rectified Movement

Range	Approx. Impedance (ohms) @ 60 Hz	Model/Size and Catalog Number		
		2-1/2" Model 155	3-1/2" Model 55	4-1/2" Model 45
0-1	600	<>	<>	06820*
0-5	200	<>	<>	06840*
0-10	887.0	<>	05380	<>
0-15	80.0	<>	05400	<>
0-100	717.2	<>	05410	<>
0-150	8.76	<>	35069	<>
0-250	3.1	06080	05420	<>
0-500	.9	<>	05430	<>

\* Rectified Models

#### AC Ammeters, Iron Vane Movement

Range	Approx. Impedance (ohms) @ 60 Hz	Model/Size and Catalog Number	
		2-1/2" Model 155	3-1/2" Model 55
0-1	.213	02100	00950
0-1.5	.105	<>	00960
0-2	.065	02120	00970
0-3	.028	02130	00980
0-5	.008	02140	00990
0-10	.004	02150	01001
0-15	.0025	02160	01010
0-25	.002	02170	01020
0-30	.0015	02180	01030
0-50	.001	02190	01040
0-75	.0002	<>	03432
0-75	.008	02200*	<>
0-100	.008	02210*	01060*
0-150	.008	02220*	01070*
0-200	.008	<>	01080*
0-250	.008	02240*	01090*
0-300	.008	<>	01100*
0-500	.008	02260*	01110*

<> Available on special order.

\* These meters require use of an external current transformer from page C4-C6

#### 4-20mA Process Meters, Dial indicates 0-100 Percent

Range	Approx. Impedance (Ohms)	Model/Size and Catalog number
4-20	5.0	35022

more >>

For more information, visit [www.simpsonelectric.com](http://www.simpsonelectric.com)

# OWNERS MANUAL

## ALS30 Series 85°C

RoHS  
Compliant

- Compact size
- Long life, 20000 hours at 85°C (U<sub>r</sub>, I<sub>r</sub> applied)
- High ripple current
- Excellent surge voltage capability
- Optimized designs available on request

### APPLICATION

Smoothing, energy storage, or pulse operation in telecommunication demanding power supplies, process control, AC-motor control, traction, welding and measuring.

### BASIC DESIGN

The ALS30/31 series of screw terminal capacitors cover a wide range of case sizes and voltage ratings featuring high ripple currents and long life performance. They are ideally suited for industrial and

commercial applications demanding high reliability and long life expectancy such as frequency converters, UPS systems and switch mode power supplies.

### SPECIFICATION

<b>Standards</b>	IEC 60384-4 Long Life Grade 40/85/56,																	
<b>Capacitance range</b>	100 – 680000 µF																	
<b>Capacitance tolerance</b>	-20 to +20%																	
<b>Rated voltage U<sub>r</sub></b>	25–500 VDC																	
<b>Surge voltage U<sub>s</sub></b>	1.15 x U <sub>r</sub> (for U <sub>r</sub> ≤ 250 VDC) 1.10 x U <sub>r</sub> (for U <sub>r</sub> ≥ 350 VDC)	Test Condition: ≤ 30s surge, 1000 cycles @ 85°C																
<b>Surge voltage U<sub>ss</sub> (Short duration)</b>	<table border="1"> <tr> <th>U<sub>r</sub></th> <th>U<sub>ss</sub></th> </tr> <tr> <td>200</td> <td>350</td> </tr> <tr> <td>250</td> <td>400</td> </tr> <tr> <td>350</td> <td>500</td> </tr> <tr> <td>400</td> <td>520</td> </tr> <tr> <td>415</td> <td>530</td> </tr> <tr> <td>450</td> <td>550</td> </tr> <tr> <td>500</td> <td>600</td> </tr> </table>	U <sub>r</sub>	U <sub>ss</sub>	200	350	250	400	350	500	400	520	415	530	450	550	500	600	Test Condition: ≤ 500ms surge, 100 cycles @ 20°C
U <sub>r</sub>	U <sub>ss</sub>																	
200	350																	
250	400																	
350	500																	
400	520																	
415	530																	
450	550																	
500	600																	
<b>Leakage current I<sub>L</sub></b>	= 0.006 x C <sub>R</sub> x U <sub>r</sub> (µA) or 6mA whichever is the smaller. Note, C <sub>R</sub> is in µF.	Test Condition: U <sub>r</sub> , 5mins., 20°C																
<b>Operational life time +85°C, U<sub>r</sub>, I<sub>r</sub></b>	<table border="1"> <tr> <th>Can Diameter</th> <th>Life (hrs)</th> </tr> <tr> <td>36</td> <td>11000</td> </tr> <tr> <td>51</td> <td>18000</td> </tr> <tr> <td>66</td> <td>19000</td> </tr> <tr> <td>77, 90</td> <td>20000</td> </tr> </table>	Can Diameter	Life (hrs)	36	11000	51	18000	66	19000	77, 90	20000	End of Life requirement: ΔC/C ≤ ±10% ESR ≤ 2 x initial ESR value I <sub>L</sub> ≤ initial specified limit						
Can Diameter	Life (hrs)																	
36	11000																	
51	18000																	
66	19000																	
77, 90	20000																	
<b>+85°C, U<sub>r</sub></b>	<table border="1"> <tr> <th>Can Diameter</th> <th>Life (hrs)</th> </tr> <tr> <td>36</td> <td>22000</td> </tr> <tr> <td>51</td> <td>36000</td> </tr> <tr> <td>66</td> <td>38000</td> </tr> <tr> <td>77, 90</td> <td>40000</td> </tr> </table>	Can Diameter	Life (hrs)	36	22000	51	36000	66	38000	77, 90	40000							
Can Diameter	Life (hrs)																	
36	22000																	
51	36000																	
66	38000																	
77, 90	40000																	
<b>Shelf Life</b>	2000 hrs at 0V +85°C, or 30000 hrs at 0V +40°C																	
<b>Temperature range</b>	-40 to +85°C (Operating) -55°C to +85°C (Storage)																	

# OWNERS MANUAL

## **TECHNICAL QUESTIONS or SERVICE:**

DECWARE LLC.  
75 S. Riverview Dr. East Peoria, IL 61611  
309 822 5255  
[Steve@decware.com](mailto:Steve@decware.com) - technical

# OWNERS MANUAL

## Added Notes:

BIASING - There are some important additional notes about biasing and output tubes that you should understand. First is the bias “window”. This means “range of adjustment” and primarily concerns the rear bias control next the power cord jack on your TORII Mono’s.

We have tried to define a window where the lowest bias setting you can achieve is 45 milliamps and the highest setting is 75 milliamps. This was done in an attempt to make it impossible to make adjustments that can either hurt the tubes or the amplifier. Unfortunately there are two main variables that can have a large effect on this bias window. They are A) The tubes used and B) the voltage at your wall outlet or power conditioner.

- A) We ship these amplifiers with KT88 output tubes. Pending the tube’s specs and age, different pairs of KT88’s can cause your amplifier’s bias window to shift UP or DOWN.
- B) Depending on the voltage at your wall outlet, which may vary during the day or when your electric heat kicks on during the winter months, the bias window of your amplifier can shift UP or DOWN. In this case, the window tends to follow the voltage. If the voltage is low (113 Volts) you may see the window move down several milliamps. If the voltage is high (125 Volts) you may see the window move up by several milliamps.

The combination of both A and B can cause the bias window to move by as much as 20 milliamps. For example, a fresh pair of KT88’s may bias up with the minimum adjustment of 60 milliamps and a maximum of over 80 milliamps when the amp is plugged into an outlet when the voltage is on the high side (125V). The same amp, with a used pair of KT88’s when the voltage at the wall outlet is on the lower side (113V) could cause the minimum adjustment to be 40 milliamps and the maximum to be 60 milliamps.

### **THE ONLY THING TO REMEMBER REALLY IS THIS:**

**The speed limit is 80 milliamps. Try not to go over this amount.**

**The ideal bias setting is between 58 milliamps and 72 milliamps. Try to keep it somewhere between these two figures.**