LM Digital Series

Level Meter Units

Two, Four, Six, Eight or Twenty-Four Channel
AES Digital with 30, 53, 60 or 106-Segment
LED Bargraph Level Meters

Document P/N **821605** Rev-**D**

User Manual

CONTENTS

Important Safety Instructions

1) **Read these instructions.**
2) **Keep these instructions.**
3) **Heed all warnings.**
4) **Follow all instructions.**
5) **Do not use this apparatus near water.**
6) **Clean only with dry cloth.**
7) **Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.**
8) **Do not install near any heat source such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.**
9) **Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wide blade or the third prong are provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.**
10) **Protect the power cord from being walked on or pinched, particularly at plugs convenience receptacles and the point where they exit from the apparatus.**
11) **Only use attachments/accessories specified by the manufacturer.**
12) **Use only with the cart stand, tripod, bracket, or table specified by the manufacturer, or sold with the apparatus. When a cart is used, use caution when moving the cart/apparatus combination to avoid injury from tip-over.**
13) **Unplug this apparatus during lightning storms or when unused for long periods of time.**
14) **Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as when power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.**
15) **Do not expose this apparatus to rain or moisture.**
16) **The apparatus shall be connected to a mains socket outlet with a protective earthing connection.**

CAUTION!

In products featuring an audio amplifier and speakers, the surface at the side of the unit, where the audio amplifier heat sink is internally attached, may get very hot after extended operation. When operating the unit excercise caution when touching this surface and ensure that external materials which may be adversely affected by heat are not in contact with it. There is a Hot Surface label (see diagram) attached to the aforementioned surface of the product.

Introduction

Congratulations on your selection of a **Wohler Technologies LM Digital Series** level meter alarm unit. We are confident it represents the best performance and value available, and we guarantee your satisfaction with it.

If you have questions or comments you may contact us at:

Wohler Technologies, Inc.
31055 Huntwood Avenue
Hayward, CA 94544
1-888-596-4537 Fax: (510) 870-0811
web: www.wohler.com
e-mail: support@wohler.com

Section 1

General Features and Specifications

Description

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Applications

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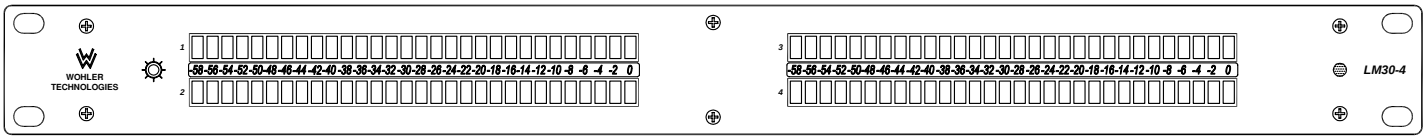
Rear Panel Configurations

Front Panel Configurations

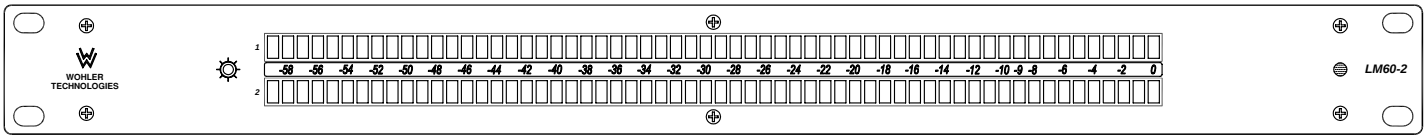
Wohler
713 Grandview Drive,
South San Francisco, CA 94080
650 589-5676 Fax: 650 589-1355

LM Digital Series

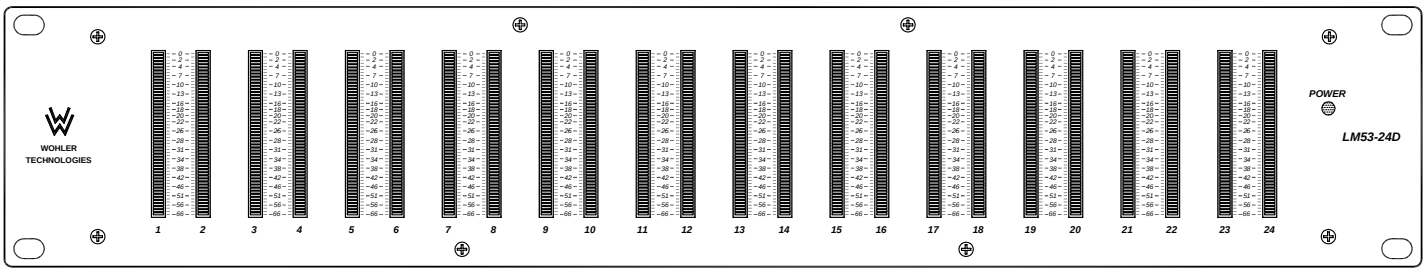
Level Metering Units



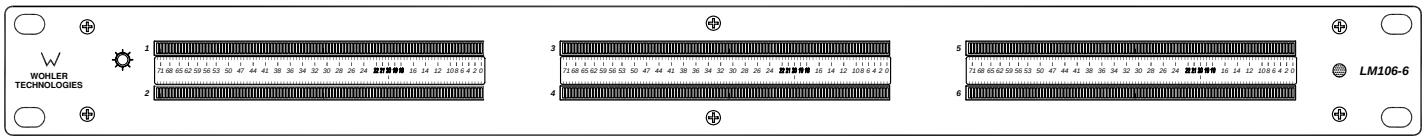
LM30-4D



LM60-2D



LM53-24D



LM106-6D

Description

Wohler Technologies line of single-rack (1U) and double-rack (2U) **AES Digital** audio level metering units provide from one to twelve pairs of **53-segment** level meters (**LM53**), one to three pairs of **106-segment** level meters (**LM106**), one to two pairs of **30-segment** level meters (**LM30**), or one pair of **60-segment** level meters (**LM60**). Two single-rack 26-segment models featuring twenty-four and thirty-two channels are also available and are covered in a seperate user manual (**LM26 Digital Series, P/N 821524**).

Standard input connectors for the **LM Digital Series** are 3-pin female **XLR** connectors. **Phoenix** or **BNC** connector inputs are available as a custom option for all versions *except* the **LM53-24**. Input connector type is specified by the customer at time of ordering. Input impedances are 110 Ω (ohm) *balanced* for **XLR** and **Phoenix** connectors and 75 Ω (ohm) *unbalanced* for **BNC** connectors. Inputs may be adjusted for **Reference Level** gain via rear panel DIP switch modules.

The standard display mode is set as a single segment **PPM 'dot'** above a **VU bar**; each segment's color is fixed according to its position on the scale. Each bargraph meter section (four channel) may be individually adjusted for a number of parameters, including **Display Mode**, **Peak Hold**, **PPM Ballistics**, **Alternate Scales**, and **Phase Correlation** via rear panel and internal DIP switch modules.

Features

- 30, 60, 53 or 106-segment tri-color bargraph level meters provide wide dynamic range
- Features **XLR** input connectors as standard. **Phoenix** or **BNC** connectors available as option
- Selectable input **Referrence Level** (-9, -18, -20 dBfs)
- Selectable **Display Mode** (VU Only, VU/PPM, or PPM Only)
- Selectable **Peak Hold** (Manual, 3-Second, 10-Second, or Off)
- Selectable **PPM Ballistics** (Type I, Type II, DIN 45406, or SSRT)
- Selectable **Phase Correlation** feature (on/off)
- Selectable alternate **Bargraph Scales** (AES, Alternate AES [LM30 only], BBC, NORDIC, and DIN)
- Front panel bargraph brightness control

Applications

The **LM Digital Series** of level metering units are an adaptable and effective way to monitor **AES Digital** audio in many applications. The following are some of the applications where an **LM Digital Series** unit would prove valuable.

- Radio Broadcast Station
- TV Control Room
- Mobile Broadcast unit
- Remote Radio Station
- Sound Staging development
- Recording Studio
- Cinema
- Theatrical Staging
- Music Design Application
- Broadcasting Schools
- Home Theater
- Any Aural Media applications

Specifications

Level Meter Type:	LED bargraph
Segment Quantity:	Small Segments: LM53 = 53, LM106 = 106 Large Segments: LM30 = 30, LM60 = 60
Level Gain (DIP switch selectable):	-9, -18, -20 dBfs
Bargraph Length:	LM53 = 2.22" (56.4 mm) LM106 = 4.44" (56.4 mm) LM30 = 6" (56.4 mm) LM60 = 12" (56.4 mm)
LED Segment Size:	LM53 & LM106 = 0.14" x 0.028" (3.57 x 0.7 mm) LM30 & LM60 = 0.305" x 0.152" (7.75 x 3.86 mm)
LED Segment Pitch:	LM53 & LM106 = 0.041" (1.05 mm) LM30 & LM60 = 0.2" (5.08 mm)
Segment Display Color:	Tri-color (red, amber, green)
Peak Emmision Wavelength:	Green: 570 nm, Red: 630 nm
Segment Brighness, (If = 20 mA):	LM53 & LM106 = 3.5 mcd LM30 & LM60 = 5.5 mcd
Segment Brightness, Uniformity:	LM53 & LM106 = <10% difference between segments LM30 & LM60 = <8% difference between segments
Adjacent Segment "Off" Brightness:	<1% of brightness of active segment
Dynamic Range, AES Scale (Standard Digital):	LM30 = 58 dB, LM60 = 59 dB LM53 = 66 dB, LM106 = 72 dB
Midscale Resolution, AES Scale (Standard Digital)::	LM30 = 2 dB, LM60 = 1 dB LM53 = 1 dB, LM106 = 0.5 dB
Input Sampling Rate:	32K - 48K Auto (AES)
Input Connectors:	XLR (Standard), BNC or Phoenix (Optional)
Digital Input Impedance:	XLR = 110 Ω (Ohm), balanced Phoenix = 110 Ω (Ohm), balanced BNC = 75 Ω (Ohm), unbalanced
AC Mains Power:	100-250 VAC, 50/60 Hz universal input, auto-switch
Power Consumption:	25 watts (1U) or 40 watts (2U) maximum
Dimensions:	1U = 3.5 x 19 x 8" (89 x 483 x 203 mm) 2U = 1.75 x 19 x 8" (44 x 483 x 203 mm)
Weight:	1U = 8 lbs (3.5 kg) 2U = 12 lbs (5 kg)

Units are certified to meet, at time of manufacture, all currently applicable product safety and EMC requirements, such as those of CE. 0 dbv ref. 0.775V RMS. Features and specifications subject to improvement without notice.

Rear Panel Configurations

The single-rack (1U) rear panels are comprised of modular panel *sections*. One to two of the modular panel sections have the audio input connector(s) (and DIP switch module), with any remaining sections being a *blank* panel. This arrangement permits mixing of different types of input modules, although such mixes are considered special order items.

1U Rack Model Rear Panels

Figure-1a (below) shows the standard 4-channel input section with 3-pin female XLR connectors available for use in the single-rack **LM Digital** models.

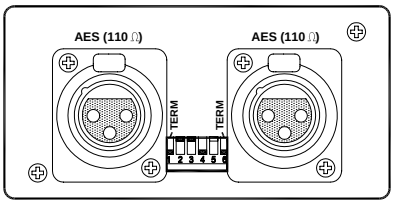
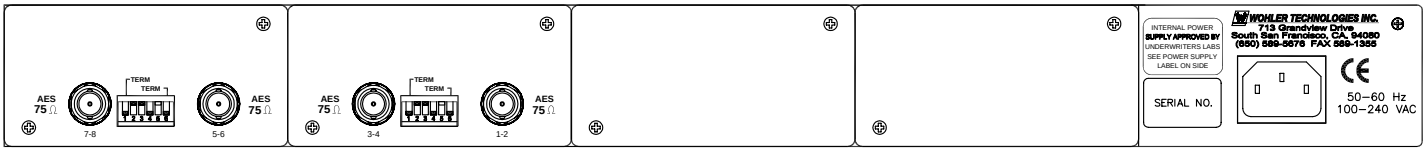


FIGURE-1a:
4-Channel Input Section
with XLR Connectors
(standard)

The rear panel illustrations below show the three connector types as configured for an 8-channel **LMxx-8** model in the **LM Digital** series. For models featuring a different quantity of inputs, the rear panel would have a different quantity of input sections and/or connectors.

LMxx-8 Rear Panel (8-Channel) with XLR Connectors
(Standard)

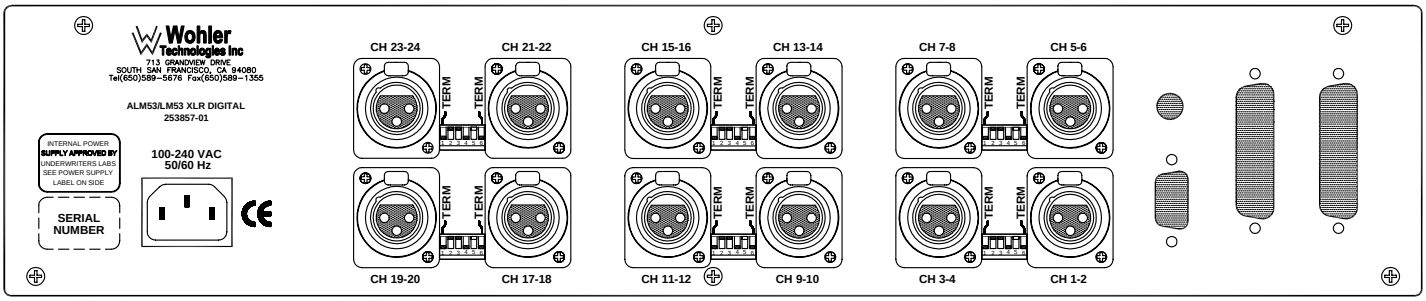
LMxx-8 Rear Panel (8-Channel) with Phoenix Connectors
(Option)



LMxx-8 Rear Panel (8-Channel) with BNC Connectors
(Option)

2U Rack Model Rear Panel

The rear panel illustration below shows the double-rack (2U) rear panel used for the **LM53-24D** model, which is NOT comprised of modular panel sections (as are the single-rack rear panels). This rear panel is available *only* with **XLR** connectors.



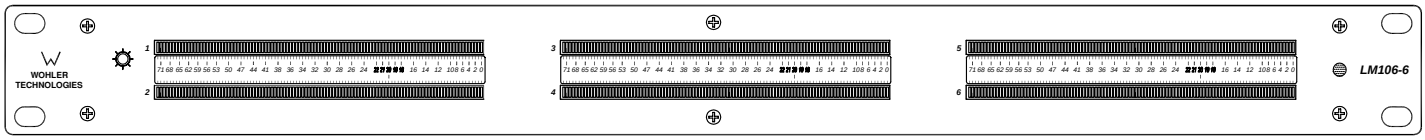
LM53-24D Rear Panel (24-Channel) with XLR Connectors
(Standard)

Front Panel Configurations

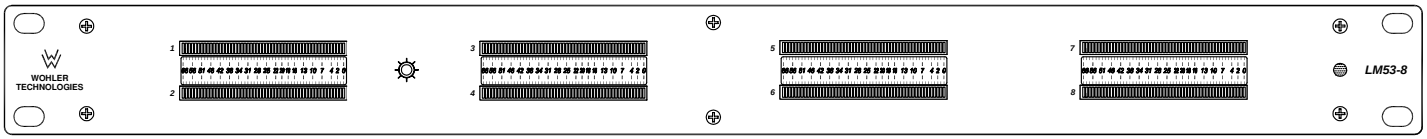
The **LM Digital Series** of level mertering units come with a variety of different bargraph sizes and quantities. The following list shows the *standard* front panel model configurations available:

LM30-2D: 1 Bargraph Pair (2 channels) with 30 large segments and Digital scale
LM30-4D: 2 Bargraph Pairs (4 channels) with 30 large segments and Digital scale
LM60-2D: 1 Bargraph Pair (2 channels) with 60 large segments and Digital scale
LM53-4D: 2 Bargraph Pairs (4 channels) with 53 small segments and Digital scale
LM53-8D: 4 Bargraph Pairs (8 channels) with 53 small segments and Digital scale
LM53-24D: 12 Bargraph Pairs (24 channels) with 53 small segments and Digital scale
LM106-2D: 1 Bargraph Pair (2 channels) with 106 small segments and Digital scale
LM106-4D: 2 Bargraph Pairs (4 channels) with 106 small segments and Digital scale
LM106-6D: 3 Bargraph Pairs (6 channels) with 106 small segments and Digital scale

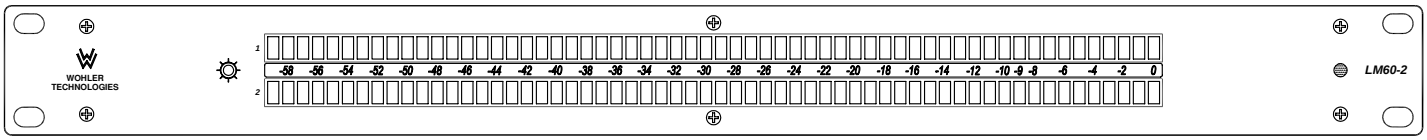
Below are examples of five of the nine *standard* front panel configurations that can be ordered.



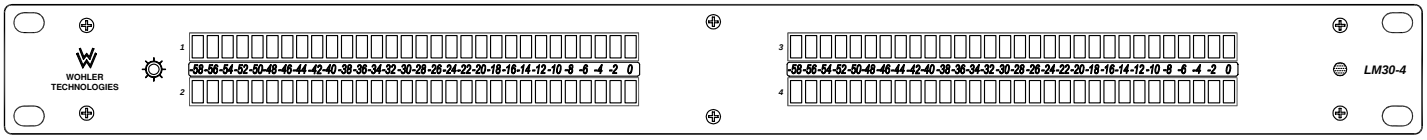
LM106-6D Front Panel
1U Six-Channel AES Digital Level Meter unit with 106-Segment Bargraphs (available in standard 2, 4 and 6-channel)



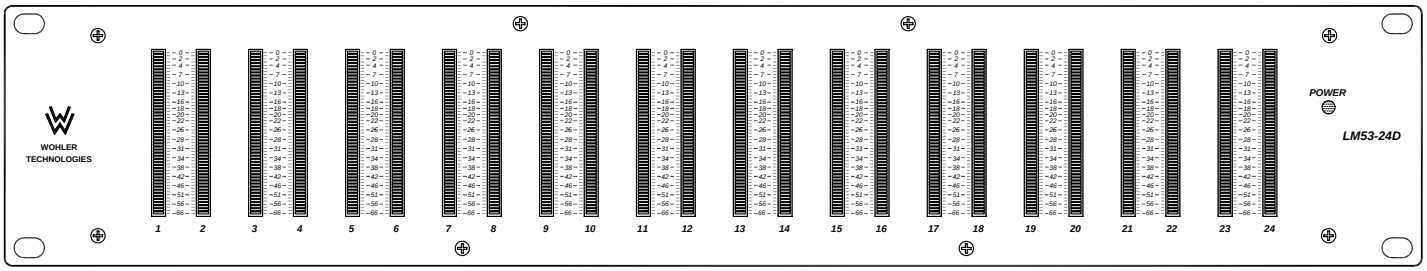
LM53-8D Front Panel
1U Eight-Channel AES Digital Level Meter unit with 53-Segment Bargraphs (available in standard 4, 6, and 8-channel)



LM60-2D Front Panel
1U Two-Channel AES Digital Level Meter unit with 60-Segment Bargraphs



LM30-4D Front Panel
1U Four-Channel AES Digital Level Meter unit with 30-Segment Bargraphs (available in standard 2 and 4-channel)



LM53-24 Front Panel
2U Twenty Four-Channel AES Digital Level Meter unit with 53-Segment Bargraphs

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Section 2

Operation

Installation

Front Panel Features

Rear Panel Features

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Installation

Mounting

The unit should be mounted where convenient for operating persons, ideally at approximately eye level for best viewing.

Heat Dissipation

No special considerations for cooling are necessary as long as the ambient temperature inside the rack area does not exceed approximately 60°C (140°F). Note that if the internal heat becomes elevated in the **LM53-24D**, it is advised to *lower* the brightness of the LED bargraph level meters using the **Bargraph Brightness Adjust Control** (**Item 1**, page **12**) as this can significantly reduce the heat generated inside the chassis.

Mechanical Bracing

The chassis is securely attached to the front panel at six points along its surface, not just at the four corners of the chassis ears. This feature will reduce or eliminate rear bracing requirements in most mobile/portable applications. The weight of internal components is distributed fairly evenly around the unit.

Audio Connections

Connection of the audio feeds is straightforward. The system interconnect block diagrams located on pages **23** and **24** may be referred to for clarification of the general signal paths into the **LM Digital Series** units.

Electrical Interference

As with any audio equipment, maximum immunity from electrical interference requires the use of shielded cable; however, satisfactory results can sometimes be obtained without it. The internal circuitry common is connected to the chassis.

AC Power

The unit's AC mains connection is via a standard IEC inlet, with safety ground connected directly to the unit's chassis. The universal AC input (100-240VAC, 50/60 Hz) switching power supply is a self-resetting sealed type, with automatic over-voltage and over-current shutdown. There is no user-replaceable fuse in either the primary or secondary circuit.

Level Meter Parameter Settings

The **Peak Hold**, **PPM Ballisatics**, and **Alternate Scale** level meter settings are selected using a DIP switch accessable *only* by removing the top cover of the unit. Should the user wish to change these settings, it should be done *before* installation into an enclosed rack or difficult to access area. See page **18** for setting information.

The input **Termination**, **Reference Level Gain** calibration, and bargraph **Display Mode** settings may be selected *after* installation via the DIP switch(es) on the rear panel as long as the rear panel is easily accessable. If installation makes the rear panel difficult to access, then these adjustments should be made *before* installation. See page **14** for setting information.

Front Panel Features

Please refer to **Figure-2a** on the following page to familiarize yourself with the front panel features of the **LM Digital Series** units. The following sections describe these functions and are referenced, by number, to **Figure-2a**.

Note: The following feature descriptions are applicable across the entire range of available models. The four models shown are examples used to illustrate the four different bargraph types available in the **LM Digital Series**.

1 Bargraph Brightness Control

This control is recessed into the front panel and can be accessed using a small flathead screwdriver. Turning it clockwise will increase the relative brightness of the bargraph LED segments. Adjusting this one control will simultaneously affect the brightness of all bargraph displays on the front panel.

Note that for the 2U **LM53-24D** model, *lowering* the LED bargraph brightness can significantly reduce heat generated inside the unit chassis (if it becomes an issue).

2 Audio Level Meters

Audio levels for the source channels are displayed via pairs of tri-color LED bargraph meters. Each pair represents two channels. There are four bargraph types available in the **LM Digital Series**; 30-, 53-, 60-, and 106-segment (26-segment units are covered in a separate manual, P/N **821524**). All bargraph LED segments are of the tri-color type (green, amber, red) and are user adjustable for **Referrence Level**, **Display Mode**, **Peak Hold**, **PPM Ballistics**, and **Alternate Bargraph Scales** via DIP switches on the rear panel and inside the unit. See pages **14** and **18** for more information regarding level meter DIP switch settings.

2a 30-Segment LED Bargraph Display **(Large LED Segments)**

The 30-segment type of tri-color LED bargraph display has a total horizontal length of 6" and features relatively *large* LED segments, which are easy to visually monitor from distances of six to thirty feet.

2b 60-Segment LED Bargraph Display **(Large LED Segments)**

The 60-segment type of tri-color LED bargraph display has a total horizontal length of 12" and features relatively *large* LED segments, which are easy to visually monitor from distances of six to thirty feet.

2c 53-Segment LED Bargraph Display **(Small LED Segments)**

The 53-segment type of tri-color LED bargraph display has a total length of 2.24" and features relatively *small* high-resolution LED segments, which are easy to visually monitor for distances up to six feet.

2d 106-Segment LED Bargraph Display **(Small LED Segments)**

The 106-segment type of tri-color LED bargraph display has a total length of 4.42" and features relatively *small* high-resolution LED segments, which are easy to visually monitor for distances up to six feet.

3 Power Indication - Green LED

This Power Indication LED signals the operating condition of the power supply. The LED glows GREEN to indicate the **LM Digital Series** unit is connected to mains power and an operation voltage is present.

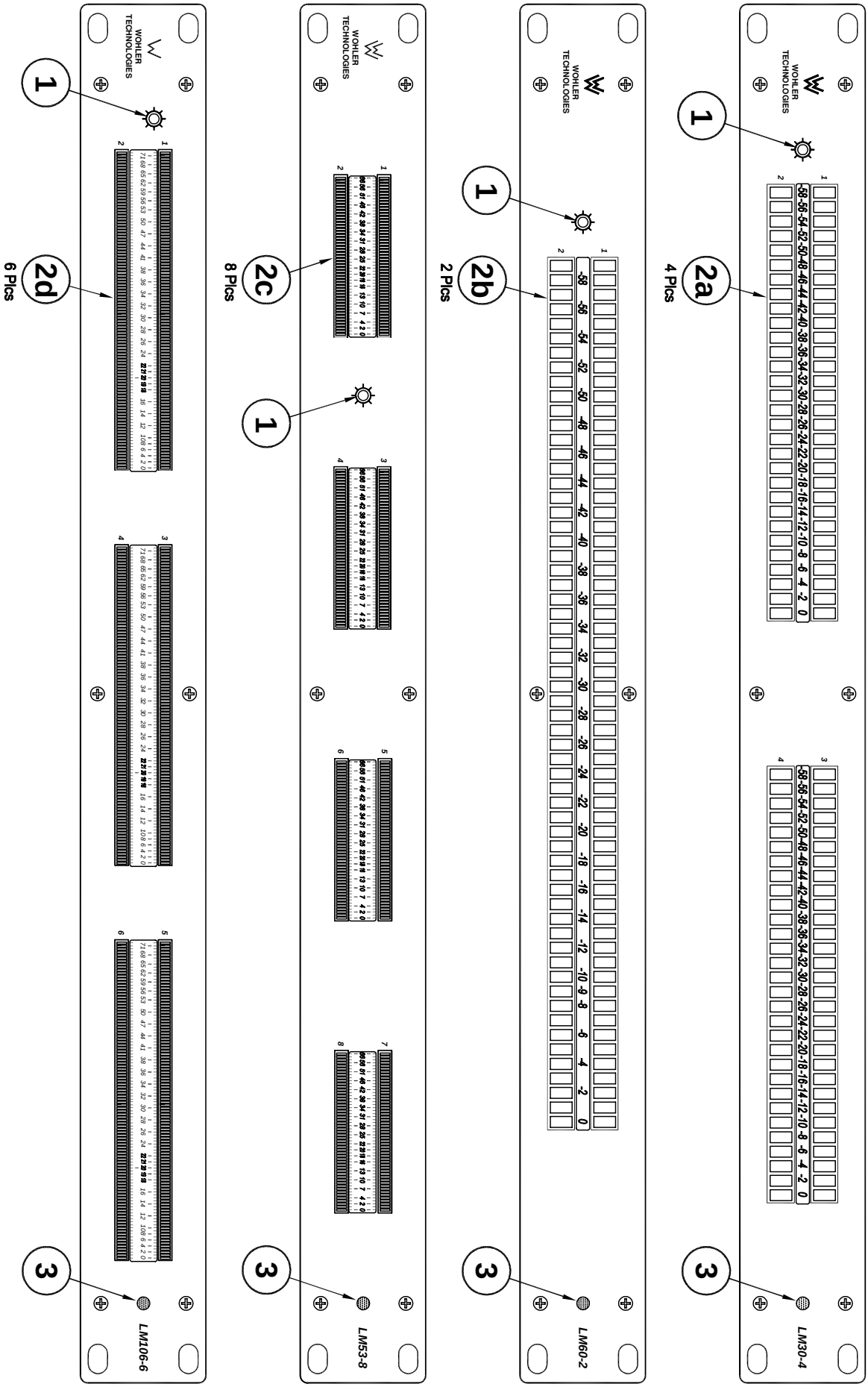


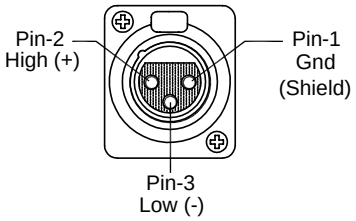
Figure-2a: LM Analog Series Front Panel Features

Front Panel Features

Please refer to **Figure-2b** on the following page to familiarize yourself with the rear panel features of the **LM Analog Series** units. The following sections describe these features and are referenced, by letter, to **Figure-2b**. Note that the features described below are applicable across the entire range of available models, and not just the models shown.

A Digital Input Connectors

These **XLR** connectors are configured for a *balanced* (110 Ω impedance) connection. Channel numbers are displayed to the side of each connector and correspond to the channel numbers next to the associated LED indicators on the front panel. As an option, **Phoenix** connectors (110 Ω impedance) and/or **BNC** connectors (75 Ω impedance) may be specified at time of order. See diagram below for XLR connector pinout. If **Phoenix** connectors are used, the pinout information is silk-screened just below each connector on the rear panel.



B DIP Switch - Rear Panel

This DIP switch sets the **Termination** for the input connectors, and selects the bargraph **Display Mode** and **Reference Level** for the associated bargraph displays. Each DIP switch module affects only the *four* channels (two input connectors) within the section in which it is located. In 2-channel units, **Termination** is set only for the *two* channels (one input connector) using only DIP switch section **6** (section **1** is not used). See the descriptions and diagram below for setting information.

Termination:

Switch sections **1** (*left* connector) and **6** (*right* connector) respectively set the termination for the connector inputs in each 4-channel input section. The respective DIP switch section should be moved to the **UP** position to **UNTERMINATE** the connector if the input signal is fed to downstream equipment. The respective DIP switch section should be moved to the **DOWN** position to **TERMINATE** the connector if the input signal is *not* fed to downstream equipment. The factory **default setting** is **TERMINATED** for each input connector. See diagam below for settings.

Reference Level:

DIP switch sections **2** and **3** determine the **Reference Level**, which adjusts the level of the input signal and the resultant level displayed on the LED bargraphs. Factory setting is -20 dBfs. See diagam below for settings.

Bargraph Display Modes:

DIP switch sections **4** and **5** determine how peak levels are displayed for the associated meters on the front panel. There are *four* possible settings; **VU Only**, **VU-PPM Floating Segment**, **PPM Only**, and **PPM-PPM Floating Segment**. The **VU Only** selection has a **VU** floating segment when a **Peak Hold** value is selected using the **Internal 10-Position DIP Switch Module** (see page **18**). The **PPM Only** selection has a **PPM** floating segment when a **Peak Hold** value is selected. The factory default setting is **VU-PPM Floating Segment**. See diagam below for settings.

LM AES Digital Rear Panel DIP Switch Settings

Termination (Left Side Input)	Reference Level	Display Mode	Termination (Right Side Input)
1 Terminated Unterminated 1 2 3 4 5 6	2 3 **-9** dBfs **-18** dBfs **-20** dBfs Not Used 1 2 3 4 5 6	4 5 **VU** Only **VU-PPM** Floating Segment **PPM** Only **PPM-PPM** Floating Segment 1 2 3 4 5 6	6 Terminated Unterminated 1 2 3 4 5 6

C Power Connector

Attach the supplied **IEC-320 power cord** between this connector and mains power (100 - 240VAC nominal, 50/60 Hz). The front panel power LED (Item **3**) will glow green to indicate operating voltages are present.

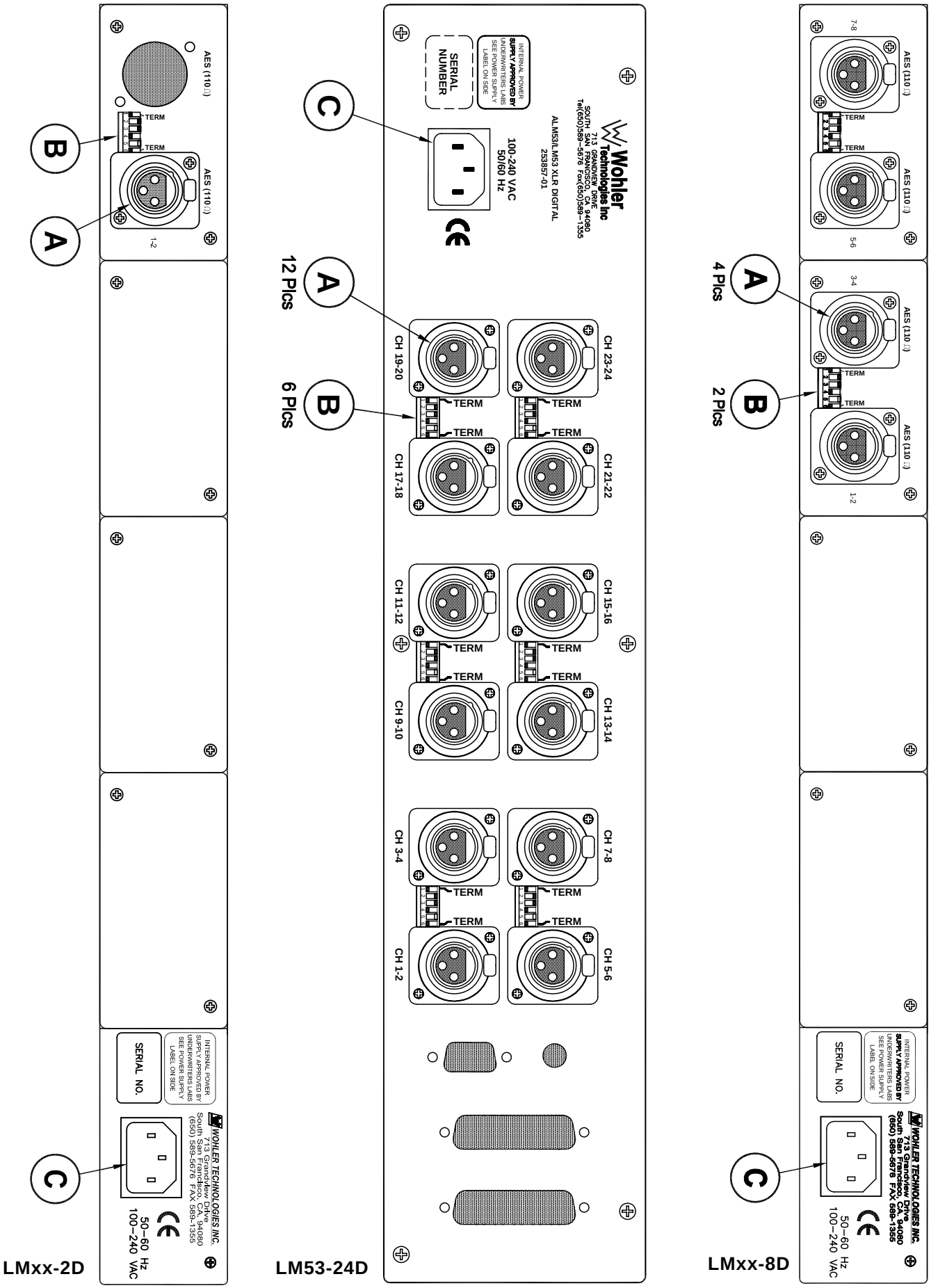


Figure-2b: LM Analog Series Rear Panel Features

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Section 3

Technical Information

Level Meter Internal 10-Position DIP Switch Settings

Level Meter DIP Switch Locations

Level Meter Alternate Scales

Phase Correlation Indication and Labeling

LM53 and LM106 Digital Interconnect Block Diagrams

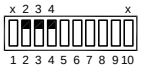
LM30 and LM60 Digital Interconnect Block Diagrams

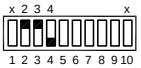
Level Meter Internal 10-Position DIP Switch Settings

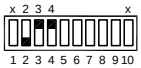
This 10-position DIP switch is accessed by removing the top cover of the **LM** unit and is located on the **919175** PCB (the same PCB on which the 6-position rear panel DIP switch is located). See **Figure-3a**, page **19** for a diagram of the **919175** PCB and the DIP switch location.

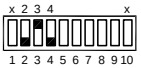
LM AES Digital Series Level Meter Internal 10-Position DIP Switch Settings

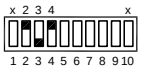
Scale Selection

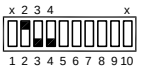

AES Scale (Standard **Digital**)

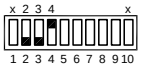

NORDIC Scale

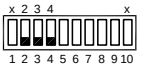

Extended VU Scale (**Analog** Models **ONLY**)


DIN Scale

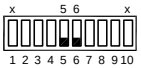

VU Scale

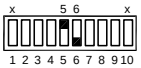

Alternate AES Scale (**Digital** LM26 & LM30 **ONLY**)

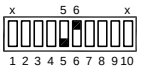

BBC Scale

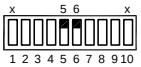

Legacy AES Scale (LM30 & LM60 **ONLY**, See Note **3**)

Peak Hold (Bargraph Display)

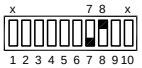

Peak Hold - **Manual** (See Note **2**)

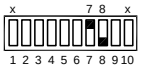

Peak Hold - **3 Second**

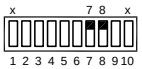

Peak Hold - **10 Second**

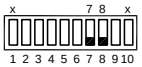

Peak Hold - **Off**

PPM Ballistics (Bargraph Display)

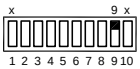

IEC268-10, Type 1

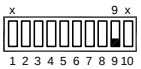

IEC268-10, Type 2


DIN 45406


Single Sample Rise Time (SSRT)

Phase Correlation Display


PC **Off**


PC **On**

Notes:

1) Switch positions **1** and **10** are NOT used and should be left at the factory set position.

2) The **Peak Hold - Manual** setting allows the bargraph display meters to indefinitely maintain the peak hold value until it is reset by the operator, either by pressing a reset button (a special option specified at time of order) or by removing power and then reapplying power to the unit (unplugging/replugging power cord). Contact Wohler for more information about this feature.

3) The **Legacy AES Scale** is available for users wishing a scale which is identical to scales used in older legacy Wohler LM30 and LM60 units. See page **21** for a diagram of this and other alternate scales available for the LM30 and LM60 units.

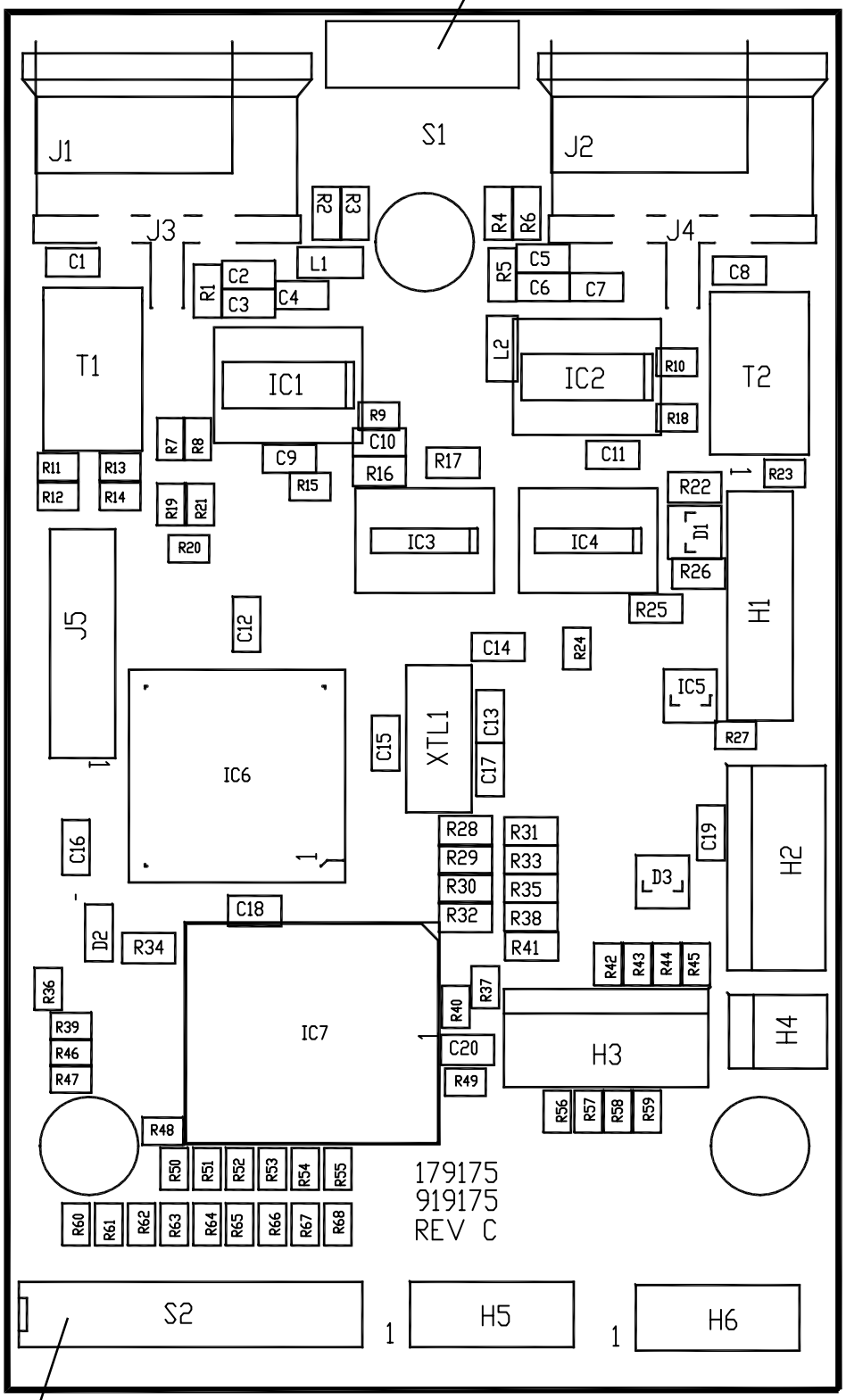
PPPM Characteristics (Ballistics):

The **PPM** characteristics determine the **Integration Time** (rise time) and **Return Time** (fall time) of the level meter. The **Integration Time** is the time it takes for the lighted segments of the level meter, after application of a 5 Khz tone at a certain reference level, to *rise* within a specified number of dB of that level. **Return Time** is the time it takes for the lighted segments of the level meter to *fall* a certain number of dB after removal of a 5 Khz tone of a certain reference level. The **PPM** characteristics available for selection using DIP switch sections **7** and **8** of the 10-position **Internal DIP Switch** (as shown in the above diagram) are as follows:

IEC268-10, Type 1:	Integration Time is **5 ms** (-2 dB), Return Time is **1.7 seconds** (20 dB)
IEC268-10, Type 2:	Integration Time is **10 ms** (-2 dB), Return Time is **2.8 seconds** (24 dB)
DIN 4506:	Integration Time is **5 ms** (-2 dB), Return Time is **1.5 seconds** (20 dB)
Single Sample:	Integration Time is a single sample, Return Time is **1.5 seconds** (20 dB)

Level Meter DIP Switch Locations

Rear Panel Level Meter 6-Position DIP Switch Module (see page 14)



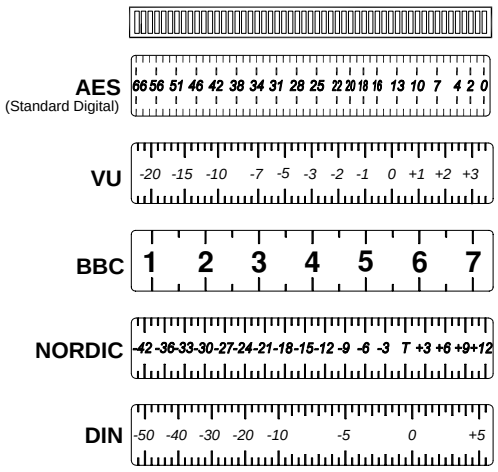
Internal Level Meter 10-Position DIP Switch Module (see page 18)

Figure-3a:
DIP Switch Locations on 919175 PCB

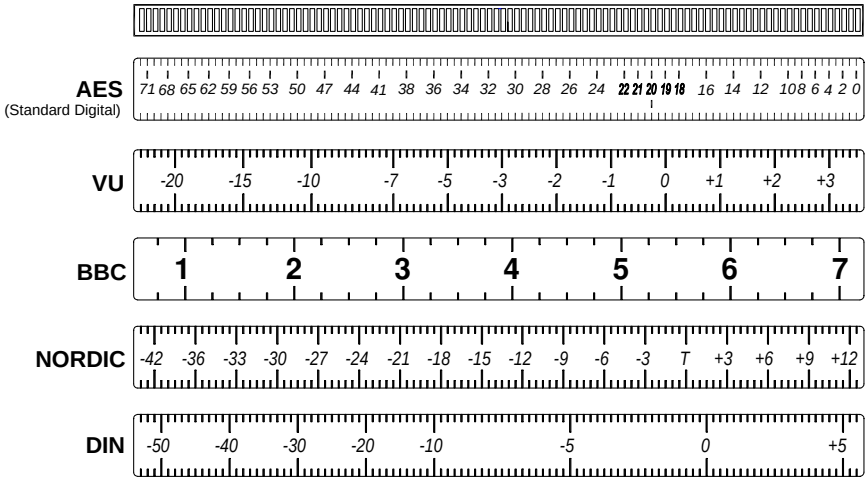
Level Meter Alternate Scales

The standard scale used on the **ALM Digital Series** of level meters is the **AES** scale. However, if alternative scale characteristics are selected for the level meters by setting the **Alternate Scale** DIP switches (see page **18**), it is recommended that a label with the appropriate scale be applied to the front panel LED bargraph level meters. Alternate scales include the **VU**, **BBC**, **NORDIC**, and **DIN** scales with an **Alternate AES** scale (showing a -9 reference) available for the **30**-segment meters. The **30-** and **60**-segment units are also available with a **Legacy AES** scale which is identical to the scales used on older Wohler **LM30** and **LM60** digital units. See the diagrams below for **53**- and **106**-segment alternate scales. See the diagrams on page **21** for the **30**- and **60**-segment alternate scales. Contact **Wohler Technologies** for more information about **Alternate Scale** labels.

53-Segment LED Bargraph



106-Segment LED Bargraph



Level Meter Alternative Scales

60-Segment LED Bargraph

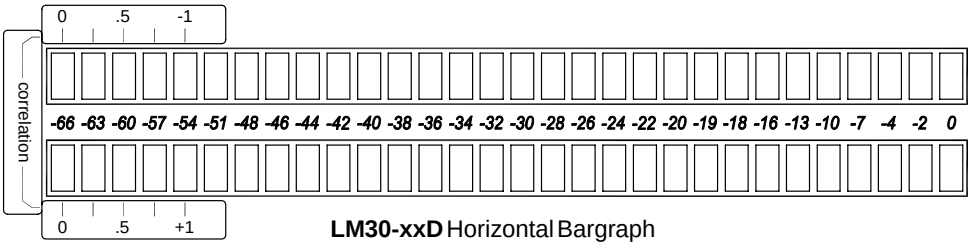
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
AES (Standard Digital)	-58	-56	-54	-52	-50	-48	-46	-44	-42	-40	-38	-36	-34	-32	-30	-28	-26	-24	-22	-20	-18	-16	-14	-12	-10	-9	-8	-6	-4	-2	0																												
Legacy AES	-66	-63	-60	-57	-54	-51	-48	-46	-44	-42	-40	-38	-36	-34	-32	-30	-28	-26	-24	-22	-20	-19	-18	-16	-13	-10	-7	-4	-2	0																												
VU					-20				-15				-10				-7				-5				-3				-2				-1				0				+1				+2				+3											
BBC						1				2				3				4				5				6				7																												
NORDIC	-42		-39		-36		-33		-30		-27		-24		-21		-18		-15		-12		-9		-6		-3		0		+3		+6		+9		+12																			
DIN	-50		-40		-30		-20		-15		-10		-5		0		+5																																									

30-Segment LED Bargraph

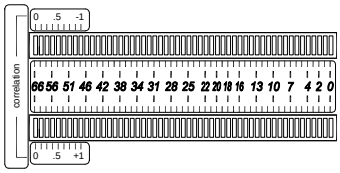
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
AES (Standard Digital)	-58	-56	-54	-52	-50	-48	-46	-44	-42	-40	-38	-36	-34	-32	-30	-28	-26	-24	-22	-20	-18	-16	-14	-12	-10	-8	-6	-4	-2	0
Alternate AES	-60	-54	-48	-42	-36	-30	-27	-24	-21	-18	-15	-12	-9	-6	-3	0														
Legacy AES	-66	-63	-60	-57	-54	-51	-48	-46	-44	-42	-40	-38	-36	-34	-32	-30	-28	-26	-24	-22	-20	-19	-18	-16	-13	-10	-7	-4	-2	0
VU	-20		-15		-10		-7		-5		-3		-2		-1		0		+1		+2		+3							
BBC	1				2				3				4				5				6				7					
NORDIC	-42		-36		-30		-24		-18		-15		-12		-9		-6		-3		0		+3		+6		+9		+12	
DIN	-50		-40		-30		-25		-20		-15		-10		-5		0		+5											

Phase Correlation Indication and Labeling

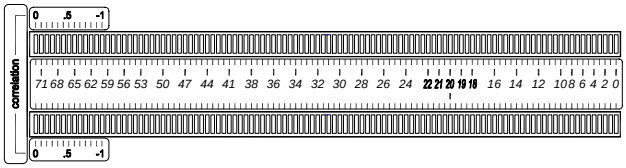
Since it is sometimes helpful to observe phase relationships between two signals being monitored, a **Phase Correlation** feature can be implemented within the lower section of an existing bargraph pair in the **LM Digital Series** units. This feature may be turned ON and OFF by setting the **Level Meter Internal 10-Position DIP Swich** module (see page 18). Below are illustrations of the level meter bargraphs with the **Phase Correlation** labels applied.



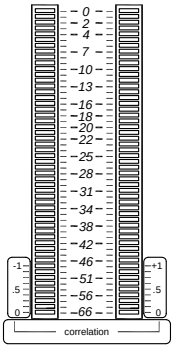
LM30-xxD Horizontal Bargraph
with Phase Correlation Labels



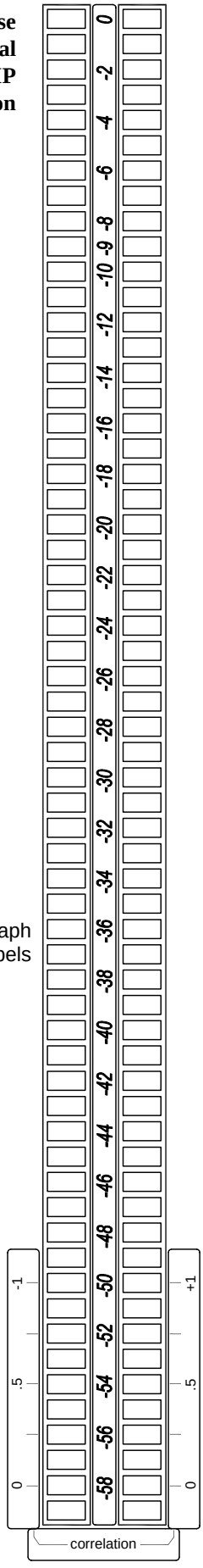
LM53 Horizontal Bargraph
with Phase Correlation Labels



LM106-D Horizontal Bargraph
with Phase Correlation Labels



LM53 Vertical Bargraph
with Phase Correlation Labels



LM60 Horizontal Bargraph
with Phase Correlation Labels

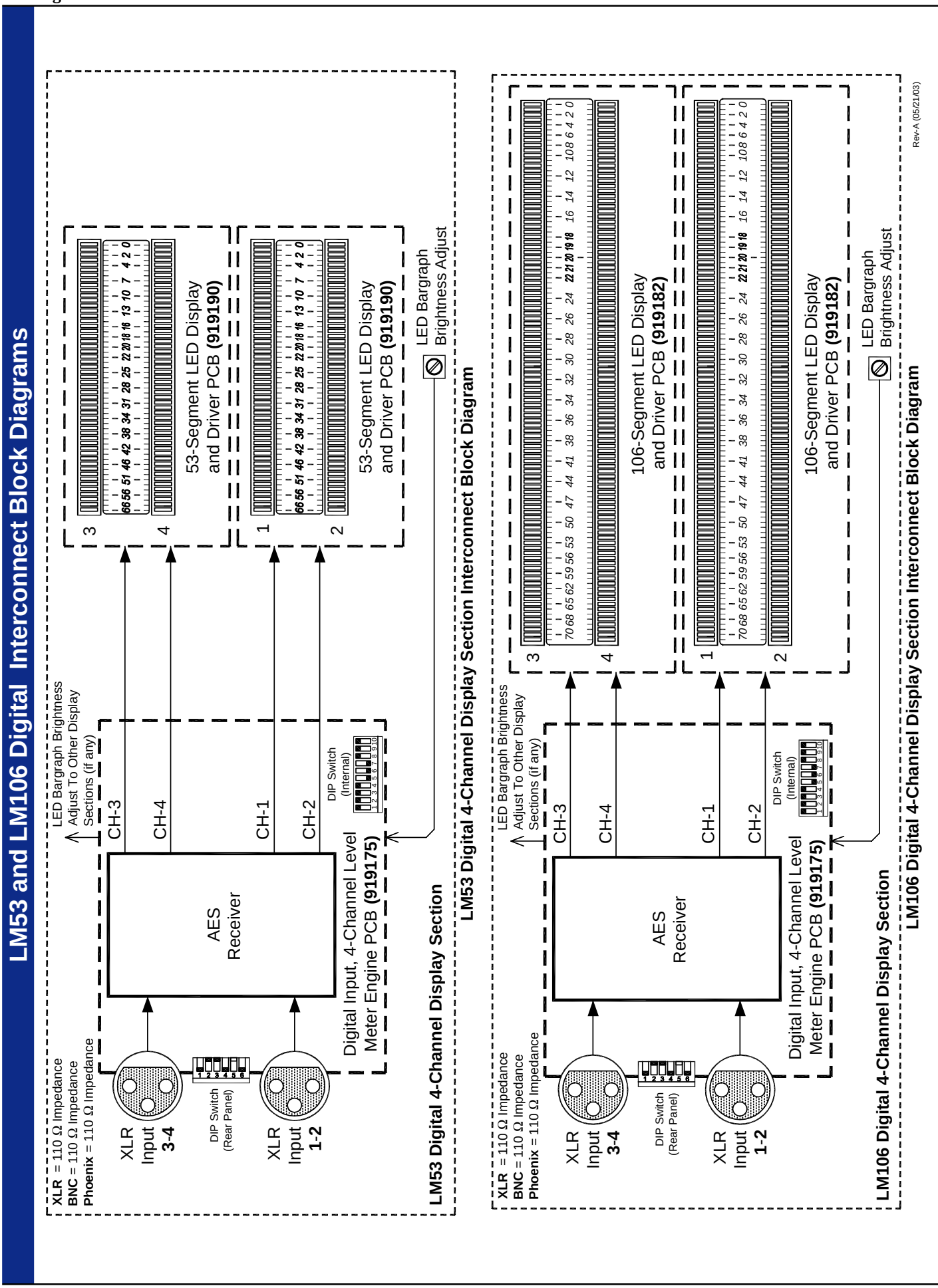
When the audio level in BOTH channels is high enough, the **Phase Correlation** display occupies the lower few segments of both bargraphs of a stereo pair. Behavior of the **Phase Correlation** indication is as follows:

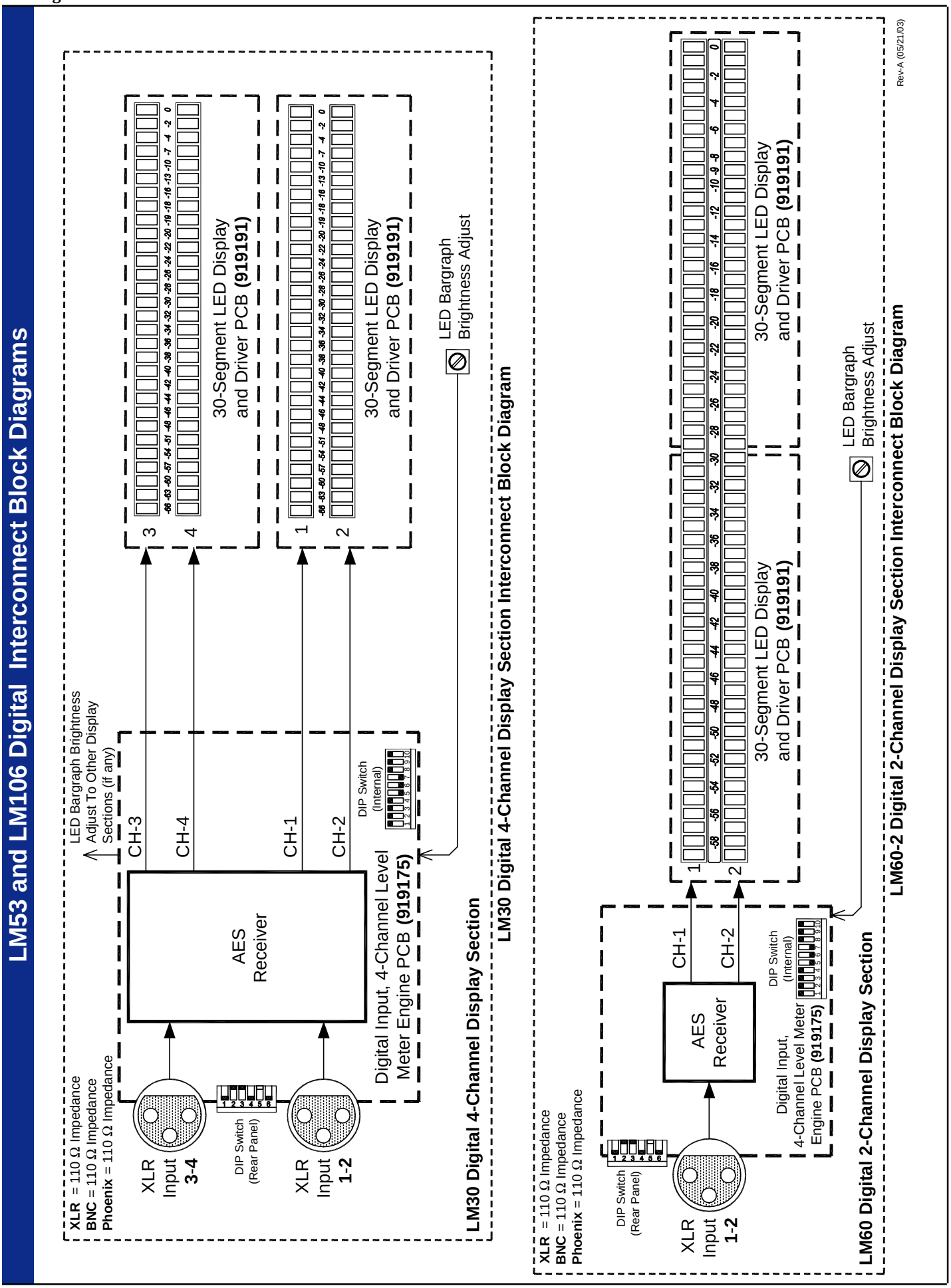
Positive correlation = ascending AMBER bar in the *lower* (or *right*) bargraph
Negative correlation = ascending RED bar in the *upper* (or *left*) bargraph

Below is a list of how many lower segments are used by each type of LED bargraph display for **Phase Correlation** indication:

53-Segment Bargraph **(LM53)** = first nine **(9)** segments
106-Segment Bargraph **(LM106)** = first Thirteen **(13)** segments
30-Segment Bargraph **(LM30)** = first Five **(5)** segments
60-Segment Bargraph **(LM60)** = first Ten **(10)** segments

One additional segment above the active correlation region is always OFF, to serve as a marker. The **Phase Correlation** display is visible ONLY so long as the VU audio level is above this blank segment (*tenth* from the bottom on 53-segment bargraph; *fourteenth* segment up on a 106-segment; *sixth* on 30-segment bargraphs and *eleventh* on the 60-segment bargraphs).





NOTE:

PCB layout and schematic support documentation is available upon request.

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