



#### FEATURES

- Battery powered
- Large 0.5" LCD display
- 0.1 degree resolution
- $\pm 0.2$  degree accuracy
- Auto-ranging: 11.8V/57V/90V
- Broadband: 57 to 1200Hz
- Small and light-weight
- No reference or synchro loading
- One year warranty

#### APPLICATIONS

- Synchro Zeroing
- Field Testing
- Trouble Shooting
- Synchro System Alignment

#### GENERAL DATA

The DSM-4™ is the industry's first hand-held digital synchro meter. This synchro angle measuring device allows the user to conveniently align and checkout synchro systems on the assembly line or in the field. It comes complete with rugged portable carrying case, test leads and battery.

The instrument is designed to be completely automatic, the only control is an ON/OFF switch. An auto-ranging function is featured covering the two ranges 7-14Vrms and 54-108Vrms. These two ranges allow the DSM-4™ to accept all standard synchro stator voltages. Rotor excitation voltages from 20-140Vrms, 47-1200Hz are also automatically handled.

A large easy-to-read LCD display is used to read the synchro angle over a range of 0-359.9 degrees to an accuracy of  $\pm 0.2$  degrees. The display features a low battery indicator to help minimize the possibility of any false readings.

The DSM-4™ uses a ratiometric conversion technique and employs a type II tracking loop which insures high noise immunity and jitter-free operation. High input impedances minimize loading affects on the synchro system being tested.

Extensive use of low power linear and digital circuitry has provided a dramatic reduction in power consumption, enabling the unit to operate for two to four weeks of average use on a single 9V rectangular alkaline battery (30 hours of actual test time).

The unit is fully specified over an operating temperature range of 0 to +50 degrees C at 80% RH. An extended range version can be ordered that will operate over a temperature range of -30 to +70 degrees C at 95% RH.

#### APPLICATIONS

Due to its small size and light weight, the DSM-4™ is ideal for field testing and trouble shooting. The unit is rugged enough to provide a long service life even in a tool box environment. Applications include trouble shooting and synchro alignment for aircraft, shipboard, and ground-based systems. The instrument is extremely useful for aligning two-speed synchro systems.

## SPECIFICATIONS

Parameter	Value
<b>Reference Input (R1-R2)</b>	
Voltage	20 to 140Vrms
Frequency	47 to 1200Hz
Input impedance	3M ohms
<b>Stator Input (S1-S2-S3)</b>	
Range switching	Auto-ranging
Voltage ranges	
Low Range	7 to 14V L-L
High Range	54 to 108V L-L
Input impedance	225K ohms, all ranges
<b>Operating Method</b>	Ratiometric, type II tracking loop, continuous conversion
<b>Digital Display</b>	
Type	0.5 inch LCD
Resolution	0.1 degree
Range	0 to 359.9 degrees
Accuracy <sup>(1)</sup>	± 0.2 degrees
LO BAT indicator	Colon
<b>Battery</b>	
Type	9V rectangular alkaline dry cell with miniature snap terminals
Life	Normally 30 hours
<b>Operating Temperature</b>	
Standard range	0 to +50 degrees C
Extended range <sup>(2)</sup>	-30 to +70 degrees C
<b>Storage Temperature</b>	-40 to +85 degrees C
<b>Humidity</b>	
Standard range	80% RH or less
Extended range <sup>(2)</sup>	95% RH or less
<b>Case Configuration</b>	
Size	6.0" x 3.12" x 0.81"
Weight	8.0 oz. including battery
Material	ABS plastic
Color	Yellow

## NOTES

- Accuracy applies for:
  - over reference and signal amplitude ranges
  - 10% reference and signal harmonic distortion
  - over operating temperature range
  - over operating frequency range
- Add suffix R to part number for extended range version

## ACCESSORIES

The DSM-4™ comes complete with the following accessories:

- Digital synchro meter . . . . . 1
- Battery (9V) . . . . . 1
- Test leads . . . . . 5
- Carrying case . . . . . 1

## THEORY OF OPERATION

The DSM-4™ is a precision instrument for measuring synchro angles and consists of the following five basic functions, (see figure 1):

- Power supply
- Auto-ranging circuitry
- Synchro to BCD converter
- BCD to seven segment decoder
- Display assembly

A 9V battery and voltage conversion circuitry provides all the dc voltages necessary to operate the unit.

The reference input (R1-R2) accepts 20-140Vrms at 47-1200Hz. The stator inputs (S1-S2-S3) accept two ranges of voltages, 7-14Vrms L-L(max) and 54-108Vrms L-L(max). The stators are continually monitored and the proper range is automatically selected. Full accuracy is maintained over both specified ranges.

The heart of the DSM-4™ is a micro-module synchro to BCD converter that accepts the range scaled synchro inputs and outputs a four decade BCD angle to an accuracy of ± 0.2 degrees.

The BCD angle is converted to a seven segment format and displayed on a 0.5 inch LCD display.

## OPERATING THE DSM-4™

When the instrument is received, the battery is not installed. Follow the procedure below for loading or replacement of the battery.

- Place screwdriver in slot in the battery cover and pry up. Battery cover is located on lower rear of instrument.
- Remove battery strap and snap on new battery.
- Place battery into compartment.
- Replace battery cover.

When battery replacement is necessary, replace only with alkaline dry cell in order to maintain specified operating life.

### CAUTION:

When replacing battery be sure to turn switch to off position

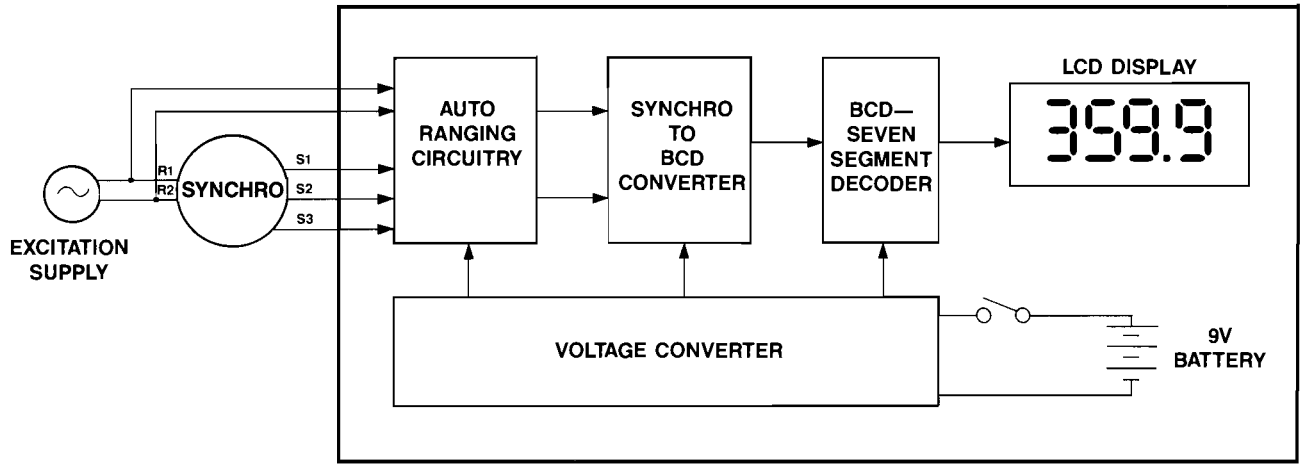
The instrument will operate for an average of 20 hours continuous on a single battery. When the colon on the display appears, there is approximately 20 minutes of battery life remaining. The battery should be changed as soon as possible.

To connect the test leads to the DSM-4™ simply insert the appropriate leads into the input jacks as indicated below:

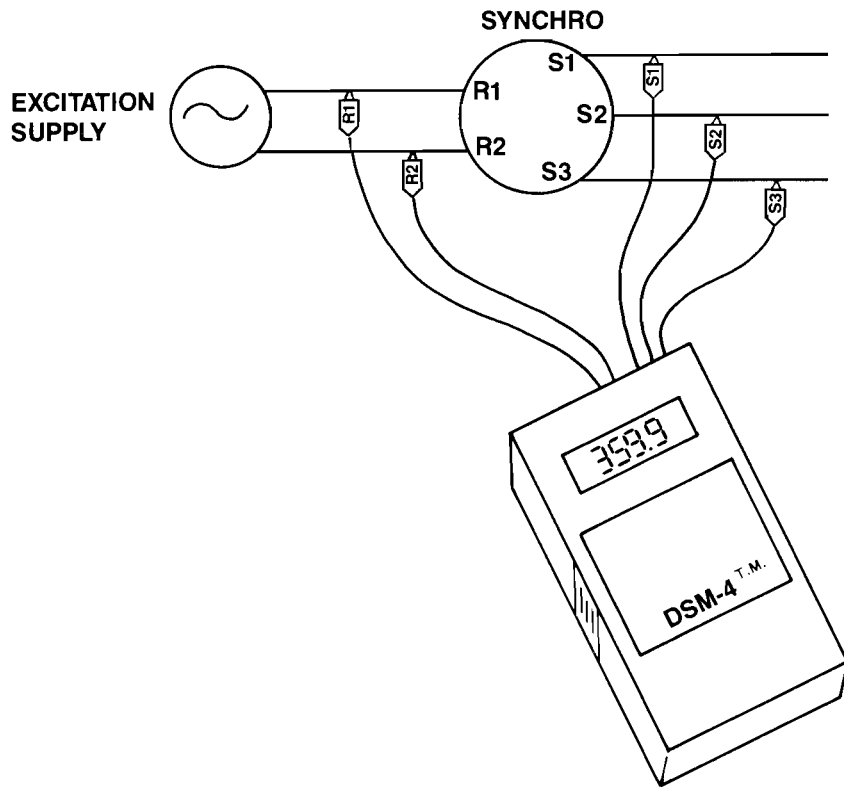
TEST LEAD		DSM-4™ INPUT JACK
MARKING	COLOR	MARKING
R1	RED	R1 (H)
R2	BLACK	R2 (C)
S1	BLUE	S1 (X)
S2	BLACK	S2 (Z)
S3	YELLOW	S3 (Y)

To connect the DSM-4™ to a synchro system, connect R1 and R2 leads to the rotor terminals and connect S1, S2 and S3 leads to the synchro stator terminals, (see figure 2).

Turn on the instrument and it will automatically select the appropriate voltage and frequency range and display the synchro angle in degrees.



**BLOCK DIAGRAM, DSM-4™**  
**FIGURE 1**



**CONNECTING THE DSM-4™**  
**FIGURE 2**

### **WARRANTY**

All units warranted against defects in materials and workmanship for 1 year from date of shipment. Liability is expressly limited to servicing, adjusting, or replacing any CSI product returned to our factory with delivery charges prepaid. In no case shall our liability exceed the original purchase price.

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