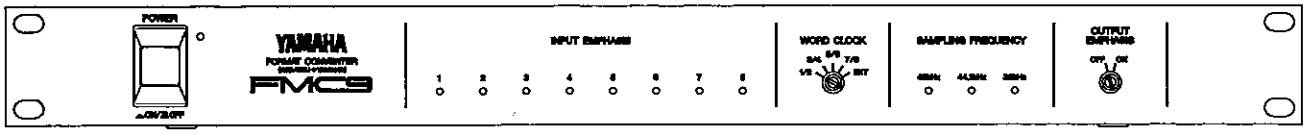
YAMAHA

FORMAT CONVERTER
CONVERTISSEUR DE FORMAT
FORMATWANDLER
(AES/EBU → YAMAHA)

FMC9

OWNER'S MANUAL
MANUEL D'UTILISATION
BEDIENUNGSANLEITUNG



Introduction

Thank you for purchasing the YAMAHA FMC9 Format Converter. This Format Converter is designed to convert four AES/EBU format digital audio signals to Yamaha's proprietary digital audio format. As an addition to Yamaha's range of professional digital audio products, the FMC9 will be extremely useful to DMP7D, DMR8, DRU8, and DMC1000 users. With the increasing use of D1, D2, and D3 format VTRs, the FMC9 simplifies digital audio interfacing for A/V applications.

Table of Contents

CANADA

THIS DIGITAL APPARATUS DOES NOT EXCEED THE "CLASS B" LIMITS FOR RADIO NOISE EMISSIONS FROM DIGITAL APPARATUS SET OUT IN THE RADIO INTERFERENDE REGULATION OF THE CANADIAN DEPARTMENT OF COMMUNICATIONS.

LE PRESENT APPAREIL NUMERIQUE N'EMET PAS DE BRUITS RADIOELECTRIQUES DEPASSANT LES LIMITES APPLICABLES AUX APPAREILS NUMERIQUES DE LA "CLASSE B" PRESCRITES DANS LE REGLEMENT SUR LE BROUILLAGE RADIOELECTRIQUE EDICTE PAR LE MINISTERE DES COMMUNICATIONS DU CANADA.

* This applies only to products distributed by YAMAHA CANADA MUSIC LTD.

FCC INFORMATION (U.S.A.)

1. IMPORTANT NOTICE: DO NOT MODIFY THIS UNIT!
   This product, when installed as indicated in the instructions contained in this manual, meets FCC requirements. Modifications not expressly approved by Yamaha may void your authority, granted by the FCC, to use the product.
2. IMPORTANT: When connecting this product to accessories and/or another product use only high quality shielded cables. Cable/s supplied with this product MUST be used. Follow all installation instructions. Failure to follow instructions could void your FCC authorization to use this product in the USA.
3. NOTE: This product has been tested and found to comply with the requirements listed in FCC Regulations, Part 15 for Class "B" digital devices. Compliance with these requirements provides a reasonable level of assurance that your use of this product in a residential environment will not result in harmful interference with other electronic devices. This equipment generates/uses radio frequencies and, if not installed and used according to the instructions found in the users manual, may cause interference harmful to the operation of other electronic devices. Compliance with FCC regulations does not guarantee that interference will not occur in all installations. If this product is found to be the source of interference, which can be determined by turning the unit "OFF" and "ON", please try to eliminate the problem by using one of the following measures:

   Relocate either this product or the device that is being affected by the interference

   Utilize power outlets that are on different branch (circuit breaker or fuse) circuits or install AC line filter/s.

   In the case of radio or TV interference, relocate/reorient the antenna. If the antenna lead-in is 300 ohm ribbon lead, change the lead-in to co-axial type cable.

   If these corrective measures do not produce satisfactory results, please contact the local retailer authorized to distribute this type of product. If you can not locate the appropriate retailer, please contact Yamaha Corporation of America, Electronic Service Division, 6600 Orangethorpe Ave, Buena Park, CA 90620

* This applies only to products distributed by YAMAHA CORPORATION OF AMERICA

Dette apparat overholder det gaeldende EF-direktiv vedrørende radiostøj.

Cet appareil est conforme aux prescriptions de la directive communautaire 87/308/CEE.

Diese Geräte entsprechen der EG-Richtlinie 82/499/EWG und/oder 87/308/EWG.

This product complies with the radio frequency interference requirements of the Council Directive 82/499/EEC and/or 87/308/EEC.

Questo apparecchio è conforme al D.M.13 aprile 1989 (Direttiva CEE/87/308) sulla soppressione dei radiodisturbi.

Este producto está de acuerdo con los requisitos sobre interferencias de radio frequencia fijados por el Consejo Directivo 87/308/CEE.

IMPORTANT NOTICE FOR THE UNITED KINGDOM

Connecting the Plug and Cord

WARNING: THIS APPARATUS MUST BE EARTHED

IMPORTANT: The wires in this mains lead are coloured in accordance with the following code:

GREEN-AND-YELLOW	:	EARTH
BLUE	:	NEUTRAL
BROWN	:	LIVE

As the colours of the wires in the mains lead of this apparatus may not correspond with the coloured markings identifying the terminals in your plug, proceed as follows:

The wire which is coloured GREEN and YELLOW must be connected to the terminal in the plug which is marked by the letter E or by the safety earth symbol or coloured GREEN and YELLOW.

The wire which is coloured BLUE must be connected to the terminal which is marked with the letter N or coloured BLACK.

The wire which is coloured BROWN must be connected to the terminal which is marked with the letter L or coloured RED.

Precautions Regarding Handling and Use

■ System

AES/EBU format digital audio signals are input via the DIGITAL INPUTS, and the eight INPUT EMPHASIS LEDs indicate whether emphasis has been applied. The SAMPLING FREQUENCY indicators show the sampling frequency of the audio data being input: 48 kHz, 44.1 kHz, or 32 kHz. After conversion, the digital audio signals are output via the 25-PIN DIGITAL OUTPUT connector. The format of the output data can be switched for use with Y1 or Y2 products.

Y1:	DMP7D	DMC1000

Y2:	DMR8	DRU8
	DMC1000	DA8X

Regardless of the individual AES/EBU input emphasis setting, emphasis for the DIGITAL OUTPUT can be set to either ON or OFF using the OUTPUT EMPHASIS switch.

The wordclock can be sourced from any of the AES/EBU inputs or from an external source connected using BNC type connections. A BNC type connector is also provided for outputting the wordclock to other equipment.

An independent 1-into-2 AES/EBU distribution facility (DIGITAL I/O) is also provided, useful for recording the same stereo signal onto two stereo tracks of a digital VTR, DTR, or DAT. One DIGITAL IN connector feeds the THRU 1 and THRU 2 connectors.

■ Installation

Please pay close attention to the following points:

- Do not place the unit in a location exposed to direct sunlight, and keep it away from sources generating heat (stoves, etc.).
- Do not place the unit in a location with a low ambient temperature.
- Do not place the unit in a location with excessive dust and moisture.
- Make sure that the unit is placed on a flat, stable surface, free from vibrations.
- Do not use excessive force.
- Do not expose switches and terminals to excessive force.

■ Power Cord Interference

It is possible for the digital signal cable to pick up interference from the power cord causing interference of the signal resulting in impaired performance. In order to avoid this problem keep the 2 cables away from each other.

■ Moving the Unit

Always remove connecting leads before moving the unit in order to prevent short circuit or breakage of the connecting leads.

■ Connections

Make sure the power switch is in the "OFF" position before connecting the power cord to an AC receptacle.

■ Precautions for Connecting Peripheral Equipment

1. Use Only Special Digital Audio Cables
   Use only digital audio cables of the following specifications when connecting equipment to the AES/EBU inputs: impedance 90 to 120 Ω, shield type, equalized cable.
   If conventional audio cables (impedance 40 to 50 Ω) are used, it is possible that the waveform of the transmission will be affected due to signal reflection caused by impedance maladjustment, or other problems will cause trouble and adversely affect the performance of the unit.
   This is especially important when connecting over distances of more than 10 meters (32 ft.) or in multiple connections. In these cases the possibility of waveform deformation is greater than under normal circumstances and the need for the proper cable becomes more acute.
2. Precautions When Using Digital Audio Cables
   - Connectors
     Be sure that the connector shell (case) and the shield wire of the cable are connected.
   - Cable Length
     Try to use the shortest cable possible.
   - Cable Extension
     Avoid extending cables through connectors whenever possible.
   - Parallel Connections
     Avoid the parallel connection of signal lines. However, if unavoidable, check the impedance and the transmission capability of the source unit and make every effort to shorten the distance of the parallel connection.
   - Other Precautions
     Treat cables with the same care given when using high frequency coaxial cables (do not bend, crush, etc.).

■ Power Supply

Always turn on the switches of the transmitting units first.

■ Do Not Open the Housing

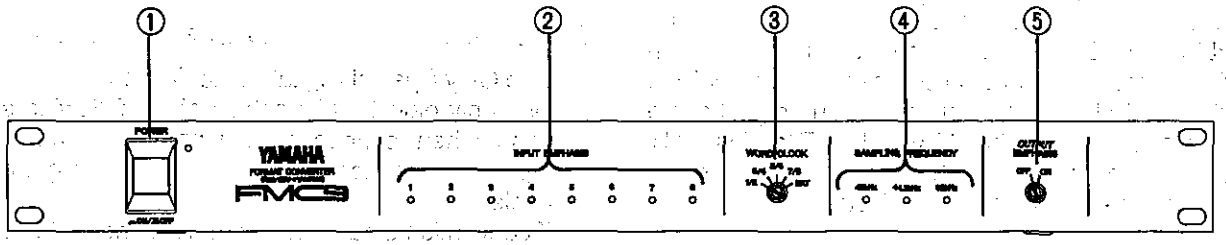
To prevent damage to the unit and to prevent electric shock do not open or modify the housing.

■ Contact Points

Clean the pins of connectors and plugs at regular intervals with a special contact point cleaning solution in order to avoid contact failures, which can be the cause of substantial performance impairments.

Controls & Connections

■ Front Panel



① POWER switch and indicator
Press to power on the FMC9. The POWER indicator will light up.

② INPUT EMPHASIS indicators
Used to indicate whether any of the eight AES/EBU digital input signals have been emphasized.

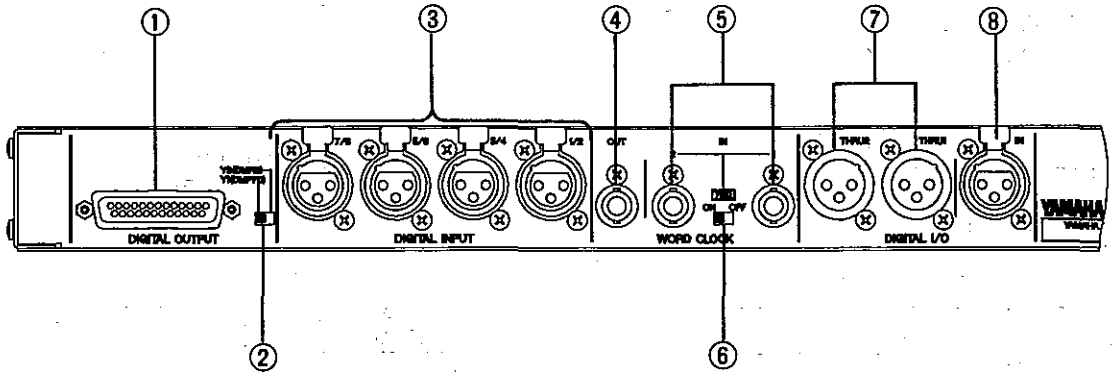
③ WORD CLOCK switch
Used to select the wordclock source: digital inputs 1/2, 3/4, 5/6, 7/8, or an external source connected to the BNC WORD CLOCK IN connectors.

④ SAMPLING FREQUENCY indicators
Used to indicate the sampling frequency of the selected word clock.

⑤ OUTPUT EMPHASIS switch
In the ON position, 50/15-µs emphasis is applied to all eight signals appearing at the digital output connector. Set to OFF, no emphasis is applied. This emphasis setting is made regardless of the individual AES/EBU input signal's emphasis setting.

* The FMC9 interprets "000" (AES/EBU digital input channel status byte 0, bits 2~4) as "No Emphasis". So if a digital input signal with this type of emphasis is input to the FMC9, the "OUTPUT EMPHASIS" switch must be set to "OFF", otherwise, the emphasis data will be calculated twice. In this case the INPUT EMPHASIS indicators will not light up. Use the emphasis functions on the device that is receiving the FMC9's digital output.

■ Rear Panel



① DIGITAL OUTPUT
A 25-PIN D-SUB connector for outputting the converted digital audio. A 25-PIN "straight", "JAE" cable should be connected here.

② Output format switch
A slide switch used to select the output format of the converted digital audio: Y1 or Y2.

③ DIGITAL INPUTS
Four female XLR-3-31 type connectors for inputting the AES/EBU format digital audio.

④ WORD CLOCK OUT
A BNC connector for outputting the word clock signal.

⑤ WORD CLOCK IN 1 & 2
Two BNC connectors for inputting external word clock signals. These connectors are internally connected in parallel, so a word clock loop-thru connection can be made.

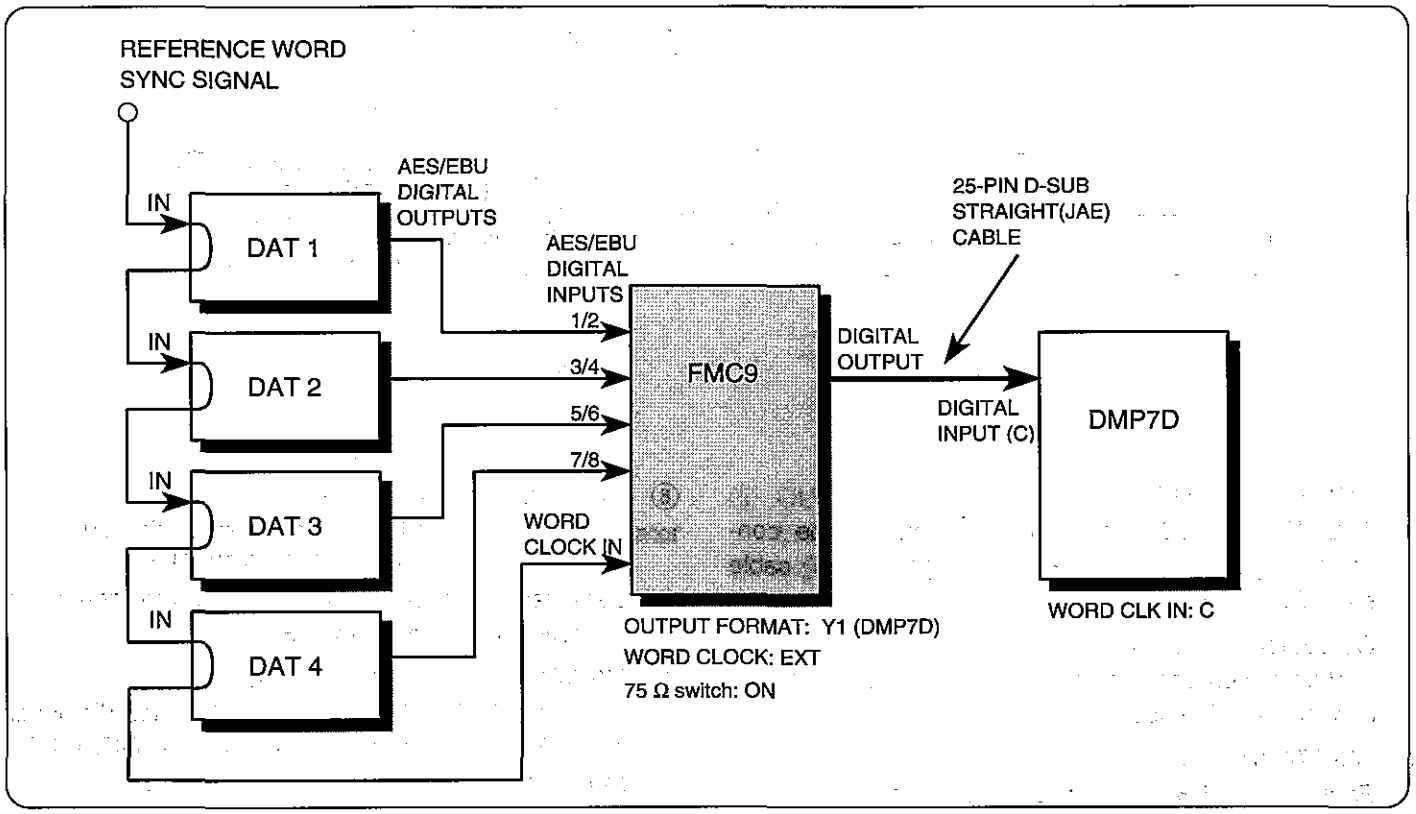
⑥ 75 Ω on/off switch
A slide switch used to set the word clock input impedance to 75 Ω. When WORD CLOCK IN connectors 1 & 2 are used to form a word clock loop-thru connection, this switch must be set to "OFF".

⑦ DIGITAL I/O THRU 1 & 2 connectors
Two male XLR-3-32 type connectors for distributing the AES/EBU signal connected to the DIGITAL I/O IN connector.

⑧ DIGITAL I/O IN
A female XLR-3-31 type connector. An AES/EBU format digital audio signal connected here will be buffered, and then output via the THRU 1 and THRU 2 connectors.

System Examples

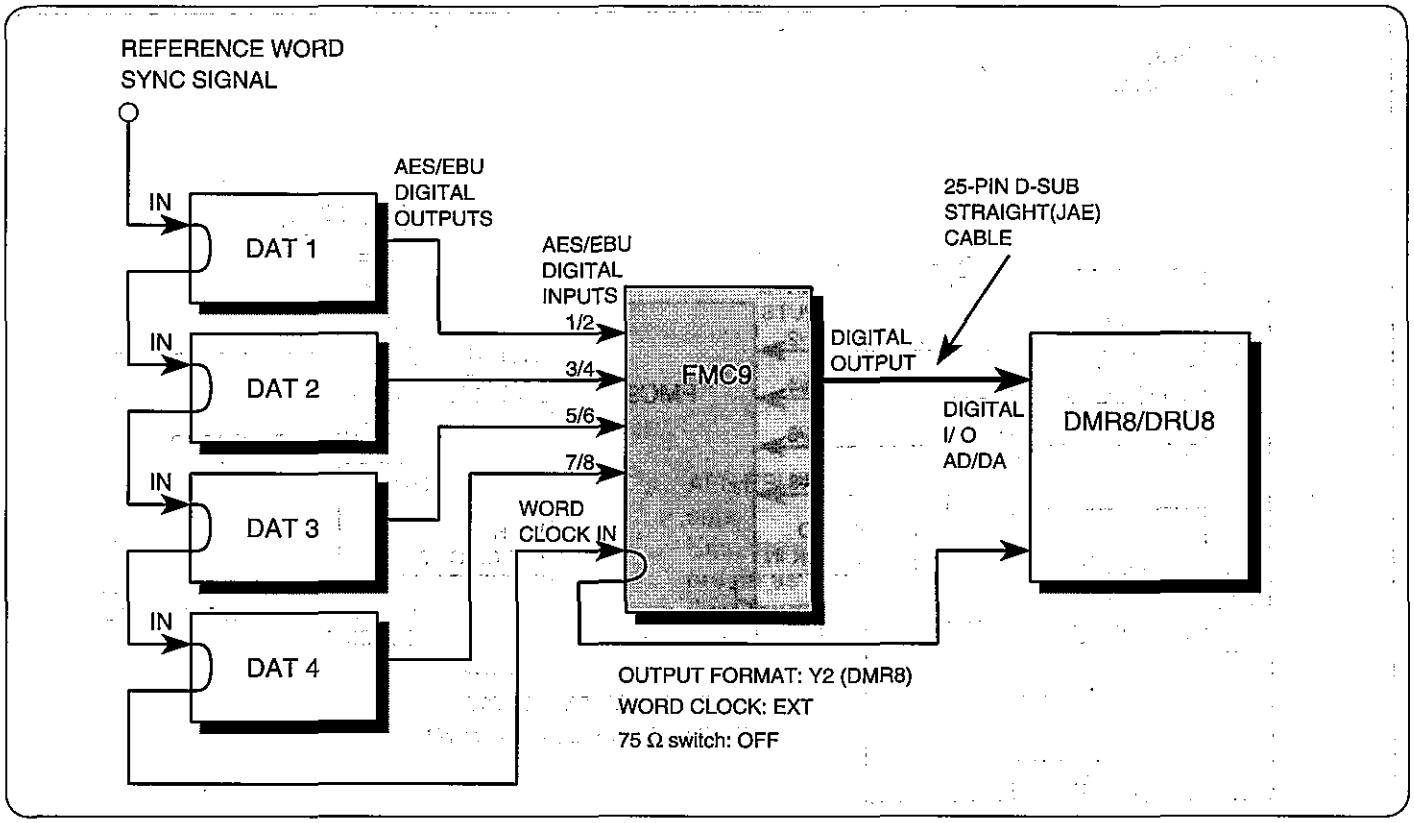
■ System Example No.1



Notes:

1. All devices must share the same word sync source.
2. Each DAT recorder must be able to synchronize to external word sync.
3. The external word sync signal is looped thru each DAT recorder. If the DAT recorders do not have a word sync loop-thru facility, use a distribution device such as the Yamaha IFU4 Interface Unit.
4. The FMC9 is set to "EXT" word clock source. Alternatively, the word clock could also be sourced from any of the AES/EBU digital inputs.
5. The DMP7D must be set to use the word clock signal appearing at the "DIGITAL INPUT" connector.
6. Use shield type cables (90~120 Ω impedance) for the AES/EBU format connections between the DAT recorders and the FMC9.

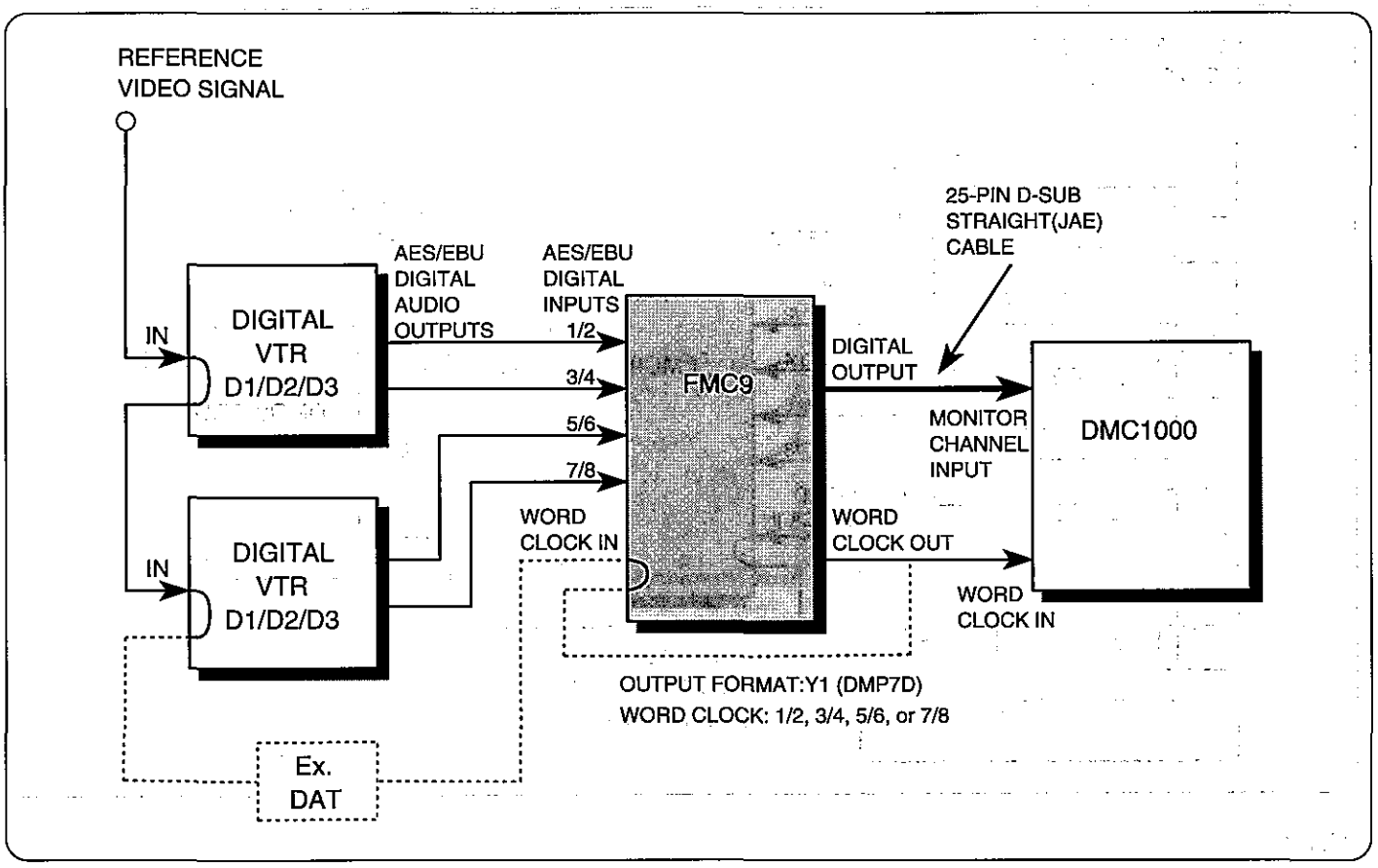
■ System Example No.2



Notes:

1. All devices must share the same word sync source.
2. Each DAT recorder must be able to synchronize to external word sync.
3. The external word sync signal is looped thru each DAT recorder. If the DAT recorders do not have a word sync loop-thru facility, use a distribution device such as the Yamaha IFU4 Interface Unit.
4. The FMC9 is set to "EXT" word clock source. Alternatively, the word clock could be sourced from any of the AES/EBU digital inputs.
5. The DMR8/DRU8 is set to external word clock source (BNC). Alternatively, the word clock could be sourced from the "DIGITAL I/O AD/DA" input (AD).
6. Use shield type cables (90~120 Ω impedance) for the AES/EBU format connections between the DAT recorders and the FMC9.

■ System Example No.3



Notes:

1. All devices must share the same sync source.
2. The FMC9 is deriving a word clock signal from one of its AES/EBU DIGITAL INPUTS, and the FMC9's WORD CLOCK switch is set to 1/2 or 3/4 or 5/6 or 7/8. A simpler, more reliable alternative word clock connection is shown by the dotted line. In this case, a device that can synchronize to a reference video signal should be connected, as shown, and the FMC9 should be set to "EXT" word clock source.
3. The digital VTRs must be set so that they produce a continuous signal from their AES/EBU digital audio outputs. If they cannot produce a continuous signal, a device that can synchronize to a reference video signal should be connected (as shown by the dotted line). In this case the FMC9 should be set to "EXT" word clock source.
4. The DMC1000 is set to external word clock source (BNC). Alternatively, the word clock could be sourced from the "MONITOR CHANNEL INPUT".
5. Use shield type cables (90~120 Ω impedance) for the AES/EBU format connections between the digital VTRs and the FMC9.

Specifications

General Specification

■ ELECTRICAL RESPONSE

Sampling frequency	48 kHz, 44.1 kHz, 32 kHz ±10% (Wide range of modes to accommodate variable pitches)
Reference for word clock	Switchable between inputs 1/2, 3/4, 5/6, 7/8 and external input.
Output emphasis	Switchable between on/off (output emphasis can be switched from on to off, and from off to on; 50/15 µs).

■ INPUT

• Format Conversion Unit

DIGITAL INPUT: 1/2, 3/4, 5/6, 7/8

Conforms to AES3-1992.

Format	AES/EBU format Channel status is effective only for emphasis data. Emphasis: 50/15 µs emphasis /no emphasis (if "000", interpreted as "no emphasis".) Data length: Switchable between 24 bits, 20 bits and 16 bits. (internal switching)
Phase allowance	Phase offset between inputs is corrected. Within a range considered to be same sample, this is within ±25% of the division between individual samples in relation to the internal word cycle (same as Word Clock Out).
Connectors	XLR-3-31 type ×4
Signal level	Minimum 200 mVp-p Eye diagram Tmin is 50% of Tnom (Tnom = 1/2 bi-phase symbol period). Maximum 7 Vp-p balanced
Impedance	110 Ω ± 20%, with transformer

WORD CLOCK IN (for external synchronization)

Format	Refer to rising edge of square waveform
Frequency	48 kHz, 44.1 kHz, 32 kHz ±10%
Jitter	±20 ns max.
Connectors	BNC-R type ×2
Signal level	TTL
Impedance	75 Ω with terminal switch for loop-thru connection

INPUT EMPHASIS DISPLAY

Display unit	Each digital input channel
Lighted	Emphasis
Blinking	No emphasis, emphasis specification "000", or no input signal.

SAMPLING FREQUENCY DISPLAY

Display unit	48 kHz, 44.1 kHz, 32 kHz
Contents	Displays value closest to word sync frequency, irrespective of contents of channel status. All indicators flash if synchronization cannot be achieved.

WORD CLOCK SELECTION SWITCH

Contents	Digital input 1/2, 3/4, 5/6, 7/8, or external
Type	Rotary switch
Operation	Flat-blade screwdriver

75 Ω ON/OFF SWITCH

Contents	Terminal switch of Word Clock In (for external synchronization). Off when loop-thru connection is used.
Type	Sliding switch

• **Distributor Unit**

DIGITAL I/O IN

Conforms to AES3-1992.

Format	AES/EBU format
Connector	XLR-3-31 type
Signal level	Minimum 200 mV p-p Eye diagram Tmin is 50% of Tnom (Tnom = 1/2 bi-phase symbol period). Maximum 7 V p-p balanced
Impedance	110 Ω ±20% with transformer

■ OUTPUT

• **Format Conversion Unit**

DIGITAL OUTPUT

Format	Switchable between Yamaha Y1 (DMP7D) type and Y2 (DMR8) type
Data length	24 bits (if emphasis operation is carried out, 24 bits will be output even if input data is short.)
Connector	*D-SUB 25-PIN, socket type*
Signal level	RS422A

WORD CLOCK OUT (INTERNAL SYNCHRONIZATION SIGNAL OUTPUT)

Format	Duty 50%, refer to rising edge of square waveform
Jitter	±20 ns max.
Connector	BNC-R type
Signal level	TTL
Impedance	Compatible with 75 Ω load.
Phase shift	± 6% in relation to synchronized input (internal switch)

OUTPUT EMPHASIS SWITCH

Contents	50/15 µs emphasis / no emphasis
Deviance	±0.2 dB max. 4 Hz ~ 22 kHz (sampling frequency = 48 kHz) ±0.2 dB max. 4 Hz ~ 20 kHz (sampling frequency = 44.1 kHz) ±0.2 dB max. 4 Hz ~ 14.5 kHz (sampling frequency = 32 kHz)
Type	Rotary switch
Operation	Flat-blade screwdriver

OUTPUT FORMAT SWITCH

Contents	Yamaha Y1 (DMP7D) type and Y2 (DMR8) type
Type	Slide switch

• **Distributor Unit**

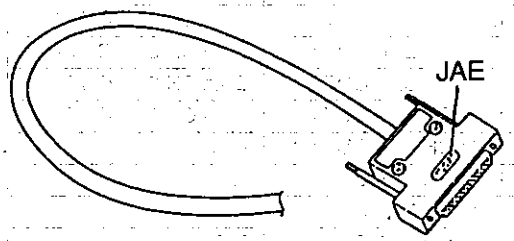
DIGITAL I/O THRU 1, 2

Conforms to AES3-1992.

Format	Same as digital input
Connector	XLR-3-32 type
Signal level	4 V p-p ±20% (when 110 Ω terminal is used)
Impedance	Compatible with 110 Ω load, with transformer.

■ POWER SUPPLY

Power requirement	U.S. & Canadian model	120 V, 60 Hz
	General model	230 V, 50 Hz
	British model	240 V, 50 Hz
Power consumption	U.S. & Canadian model	10 W
	General model	15 W
	British model	15 W
Dimensions (W × H × D)	480 × 45.3 × 323.3 mm (18.90″ × 1.78″ × 12.73″)	
Weight	3.8 kg (8 lbs, 5 oz)	
Cable used	Straight cable for DMR8/DRU8/FMC9 (D-SUB pin 25, made by JAE)	



■ AMBIENT ENVIRONMENT

- **Temperature**

Operating temperature Performance guaranteed	10 ~ 35°C (50 ~ 95°F)
STORAGE TEMPERATURE	–20 ~ 55°C (–4 ~ 131°F) (With no condensation.)

- **Humidity**

Operating humidity	30 ~ 70%
Storage humidity	25 ~ 90%

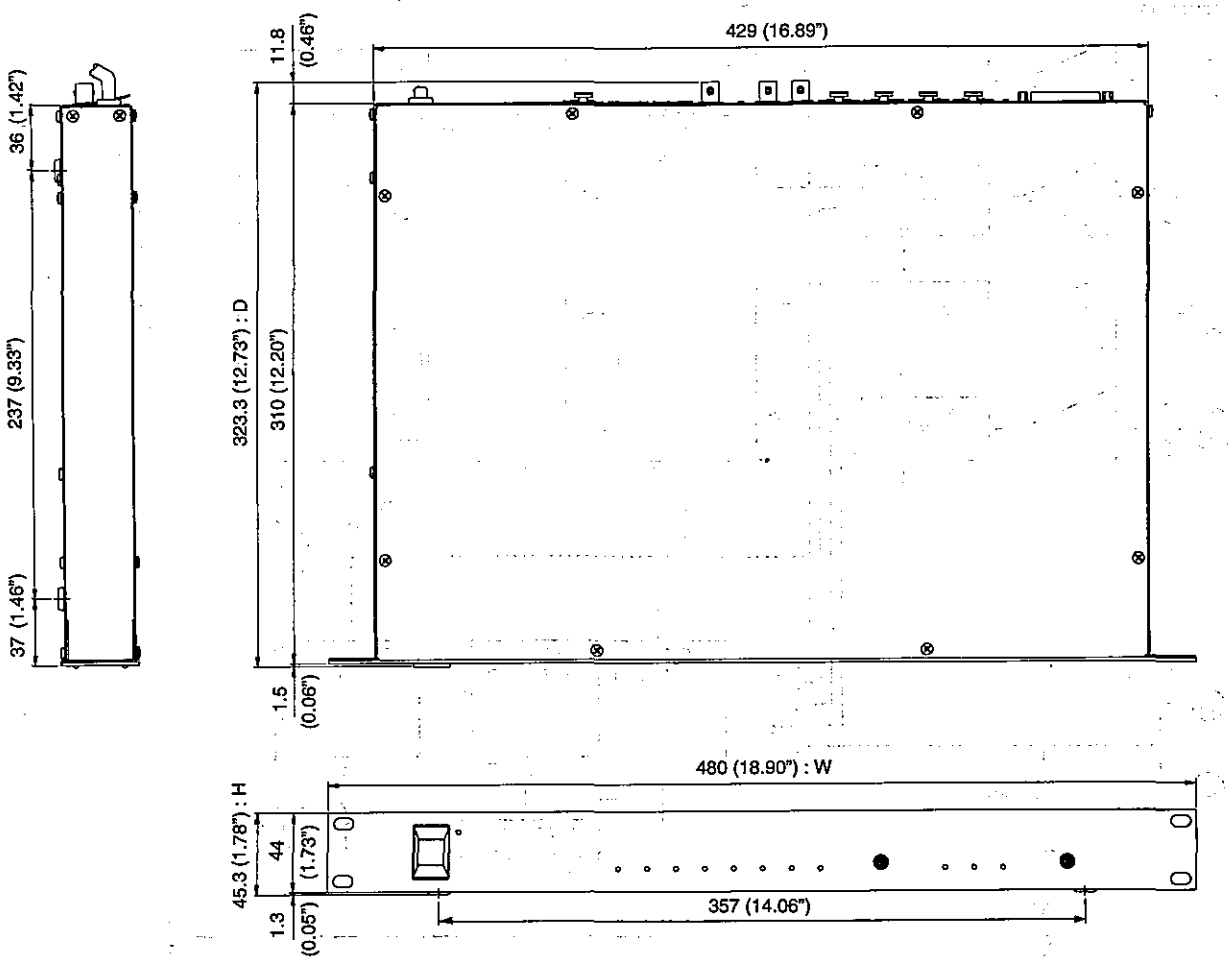
Connector Pin Details

■ Digital Output

PIN No.	Y1	Y2
1	Data CH 1, 2 OUT (+)	Data CH 1, 2 OUT (+)
2	Data CH 2, 1 OUT (+)	Data CH 3, 4 OUT (+)
3	Data CH 3, 4 OUT (+)	Data CH 5, 6 OUT (+)
4	Data CH 4, 3 OUT (+)	Data CH 7, 8 OUT (+)
5	Data CH 5, 6 OUT (+)	N/C
6	Data CH 6, 5 OUT (+)	N/C
7	Data CH 7, 8 OUT (+)	N/C
8	Data CH 8, 7 OUT (+)	N/C
9	Word Clock OUT (+)	Word Clock OUT (+)
10	Word Clock IN (+) *	Word Clock IN (+) *
11	N/C	Emphasis
12	Emphasis	N/C
13	Ground	Ground
14	Data CH 1, 2 OUT (–)	Data CH 1, 2 OUT (–)
15	Data CH 2, 1 OUT (–)	Data CH 3, 4 OUT (–)
16	Data CH 3, 4 OUT (–)	Data CH 5, 6 OUT (–)
17	Data CH 4, 3 OUT (–)	Data CH 7, 8 OUT (–)
18	Data CH 5, 6 OUT (–)	N/C
19	Data CH 6, 5 OUT (–)	N/C
20	Data CH 7, 8 OUT (–)	N/C
21	Data CH 8, 7 OUT (–)	N/C
22	Word Clock OUT (–)	Word Clock OUT (–)
23	Word Clock IN (–) *	Word Clock IN (–) *
24	Ground	Ground
25	Ground	Ground
CASE	Frame Ground	

* Not used by the FMC9.
N/C : No Connection.

Dimensions

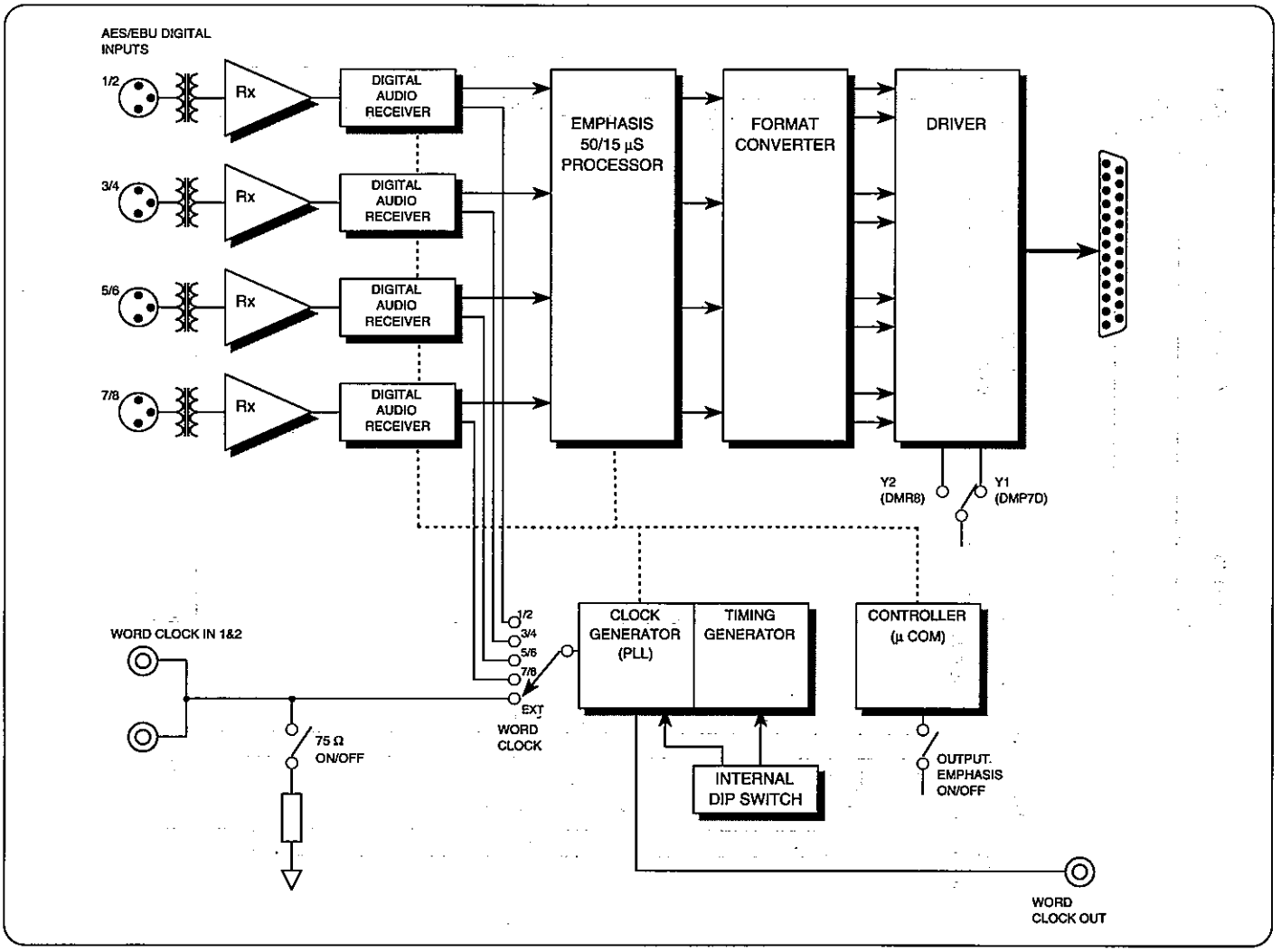


Unit: mm (inch)

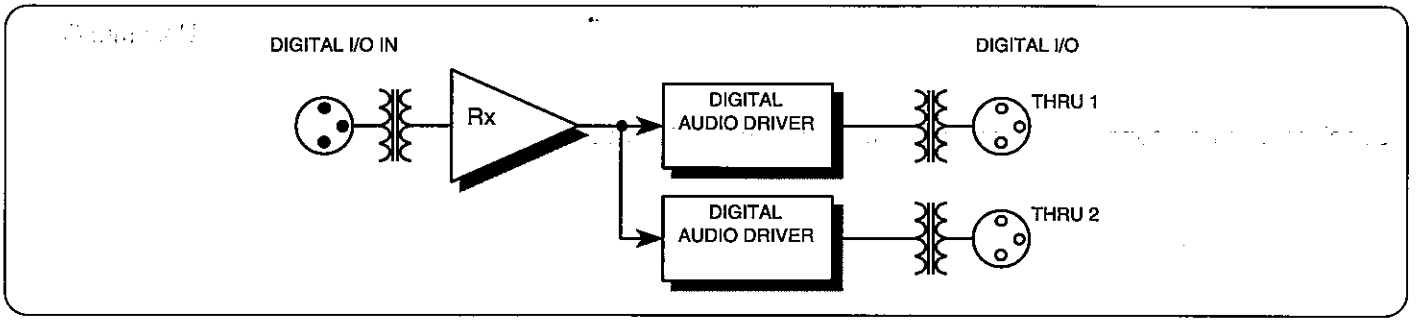
Specifications and appearance are subject to change without notice.

Block Diagram

■ Format Converter



■ AES/EBU Distributer



Internal DIP Switch

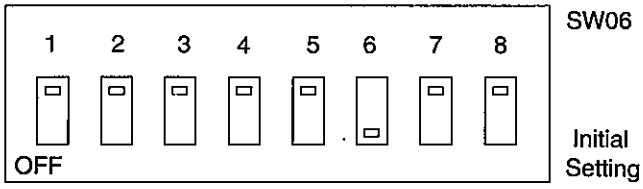
By switching the dip switch (SW6-1~8) inside the unit, the following two kinds of system settings are available.

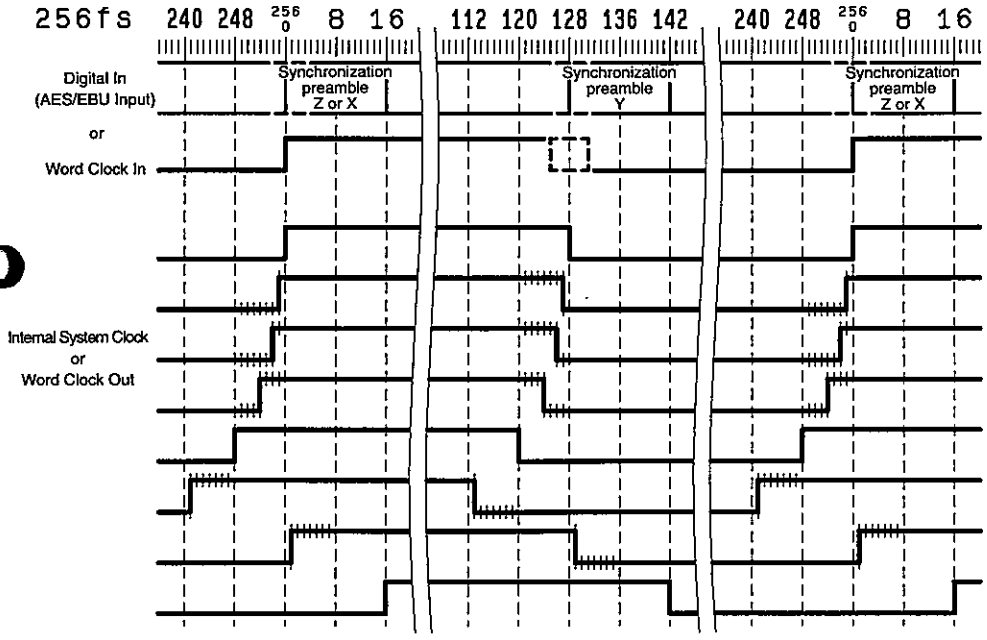
1. Shift of the internal system work clock phase
   Use SW6-1~5 to shift the input word clock (including Digital In) to the standard. However, the time relation between the output data waveform and word clock waveform will not change.
   The default setting: each of SW6-1~5 are "ON" and there is no phase shift.
   The figure shows the relation between the switch number and the phase shift.

2. AES/EBU input signal data length setting
   Use SW6-6~7 to select 16, 20, or 24 bit as the data length of the input AES/EBU signal.
   The default setting is SW6-6 "OFF", SW6-7 "ON", and data length 24 bit.
   The table shows the relation between the switch number and the data length.

When system change is necessary, please contact the dealer where you purchased your unit.
* SW6-8 set to "ON" is the same as the default setting.

Switch 6–6	Switch 6–7	Data length
OFF	ON	24-bit (initial setting)
ON	OFF	20-bit
OFF	OFF	16-bit
ON	ON	Not used. Do not make this setting.





SW 6-5	SW 6-4	SW 6-3	SW 6-2	SW 6-1
ON	ON	ON	ON	ON
ON	ON	ON	ON	OFF
ON	ON	ON	OFF	ON
ON	ON	OFF	ON	ON
ON	OFF	ON	ON	ON
ON	OFF	OFF	OFF	OFF
OFF	OFF	OFF	OFF	OFF
OFF	ON	ON	ON	ON

Initial Setting