IM-A-838 February 2011

INSTRUCTION MANUAL

ESYN-30A

SYNCHRONOUS EXTENSION UNIT

Do not use the product in methods other than described in this Manual.

－CONTENTS－

This Instruction Manual describes ESYN-30A Synchronous Extension Unit (hereinafter referred to as the ESYN-30A.)

STANDARD ACCESSORIES

The following accessories are packed in ESYN-30A. When unpacking, check the contents to ensure that all accessories are enclosed.

Warranty and Test Data Sheet ..... 1 each

OPTIONS

- A set of one (1) OUT Cable (N-106) and one (1) IN Cable (N-107)
- A set of one (1) terminator connector M (ESYN-1A) and one (1) terminator connector S (ESYN-2A)
- Synchronous cable of 100 m for the ESYN-30A (N-108)
- Synchronous cable of 10 m for the ESYN-30A (N-109)
- Synchronous cable of 20 m for the ESYN-30A (N-110)
- Synchronous cable of 50 m for the ESYN-30A (N-111)

SAFETY PRECAUTIONS

The ESYN-30A is designed to be used according to "5. HARDWARE SPECIFICATIONS." Do NOT use the ESYN-30A in environment exceeding the scope of the above specifications. Or, system failure may result in.

PRIOR TO USE

For safe use of the ESYN-30A, be sure to read the following precautions.
KYOWA ELECTRONIC INSTRUMENTS CO., LTD. assumes no liability for any damages resulting from the user's failure to comply with the safety precautions.

SAFETY SYMBOLS

For safety operation of the ESYN-30A, the following "WARNING" and "CAUTION" symbols are used in "Safety Precautions" of this manual and indicated on the product.

⚠ WARNING	Improper operation of the system may result in severe injury or death of the operator.
⚠ CAUTION	Improper operation of the system may result in injury to the operator and physical damage to the system.

⚠ WARNING

- Avoid Using in Environment with Inflammable Gas, etc.
  To prevent the risk of fire hazard or explosion, do not use the ESYN-30A in environment with inflammable gas, vapor or dust.
- Do not operate the ESYN-30A in environment with excessive moisture, dust or oil dust.
- Do not disassemble the ESYN-30A. Or, deterioration or malfunction of the instrument may result.
- Protective Grounding
  Do not forget to connect the protective ground terminal. Or, electric shock hazard, deteriorated performance, and damage of the product may result.

⚠ CAUTION

- Use the ESYN-30A in the specified operating temperature range 0 to 50 °C.
  Use at temperature exceeding the specified range may lower the performance and cause trouble. If use under direct sunlight or in a cold place is inevitable, prepare a sunscreen or take proper measured to keep it warm.

- Immediately stop the ESYN-30A if operating environment changes abruptly.
  Leave the ESYN-30A as it is until it becomes adaptable to environment.
  Abrupt change in ambient temperature due to transportation, etc. may cause dew condensation result to deteriorate its performance and cause trouble.

- Do not use the ESYN-30A in an area that is subjected to significant vibration or impact.
  Use the ESYN-30A in an area where vibration and impact can be kept within the scope of specifications.
  Applying continuous vibration or large impact may degrade performance and cause damage to the ESYN-30A. Set the ESYN-30A on a vibration isolation table to reduce the applied vibration and impact.

- Take care not to drop it during transportation and avoid applying strong impact.

- Do not use the ESYN-30A in strong electromagnetic field.
  Use the ESYN-30A in a magnet field environment where the PC may be used.
  If the ESYN-30A is used near EDX units generating strong magnet field such as a telemetry system, microwave oven, electric furnace, etc., its performance may be lowered and erroneous operation and trouble may result.

- Do not pull cords and cables.
  Lay cords and cables with a certain allowance so that unreasonable force is applied to the connections.
  Pulling or applying unreasonable force may cause trouble or interrupt the measurement.

- You cannot use RCU-41A or RCU-42A in the synchronous operation system including the ESYN-30A.

NOTATIONS USED IN THE INSTRUCTION MANUAL

Informational Notes

Certain notations are used as necessary to attract your attention to information that requires special care when handling the ESYN-30A, and to information provided for reference purpose.

Example of Notations

NOTE

Essential precautions required when handling the ESYN-30A.

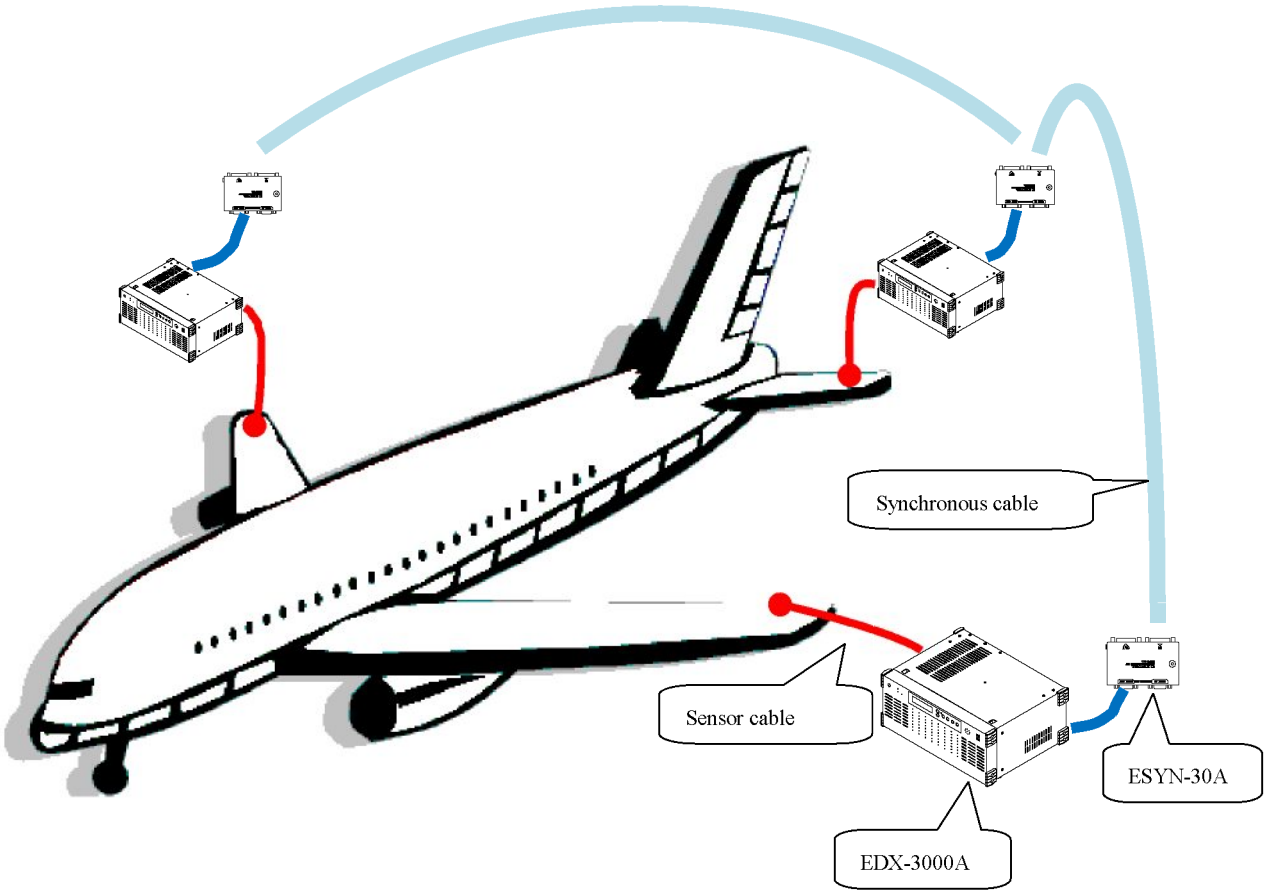
MEMO

Reference items required when handling the ESYN-30A.

1. PRODUCT OUTLINE

1-1 OVERVIEW

ESYN-30A is a unit designed for decentralized arrangement in synchronous measurement with multiple EDX-3000A units and EDX-100A units (EDX-3000A and EDX-100A are hereinafter referred to as the EDX.)
When the ESYN-30A is not used, a synchronous cable of 2 m is used for connecting the EDX units and decentralized arrangement of the connecting EDX is not available. If the ESYN-30A is used, decentralized arrangement of the connecting EDX units becomes available and you can set EDX units near the target sensors (measuring targets.) Since length of sensor cables can be shortened, you can measure data that is less affected by reduced sensitivity or external noise.



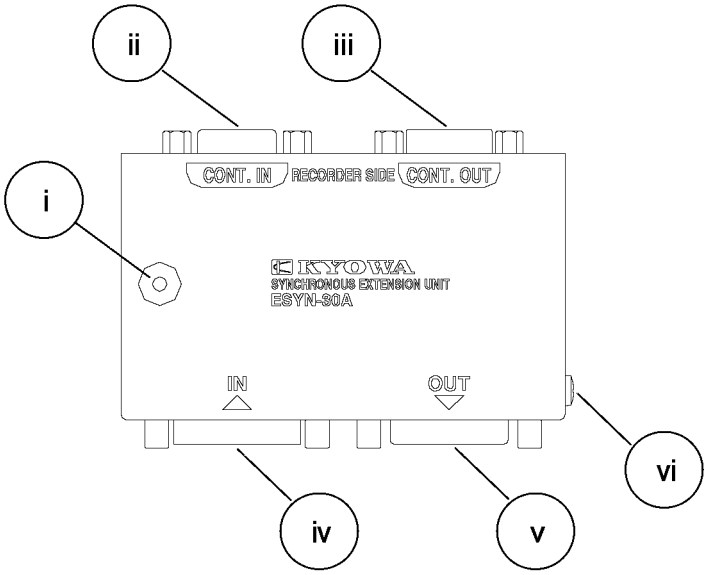
1-2 FEATURES

○ Capable of using the ESYN-30A with the EDX.

○ All you need is connect the ESYN-30A to the EDX.
(Power of the ESYN-30A is supplied from the EDX.)

○ If a system is configured with EDX-3000A units only, extension cables between EDX-3000A units can be extended up to 100 m. However, if one (1) EDX-100A is included in a system, extension cables can be extended up to 50 m. For details, refer to "5. HARDWARE SPECIFICATIONS."

2. PARTS NAMES AND MAIN FUNCTIONS



(i) POWER LED	When the EDX-3000A is connected: Lights up in green. When the EDX-100A is connected: Lights up in orange.
(ii) CONT. IN Connector	Connect the "CONT. IN Connector" of the EDX with the IN Cable (N-107.) For details, refer to "3. HOW TO USE ESYN-30A."
(iii) CONT.OUT Connector	Connect the "CONT. OUT Connector" of the EDX with the OUT Cable (N-106.).For details, refer to "3. HOW TO USE ESYN-30A."
(iv) IN Connector	Connect the "OUT Connector" of the another ESYN-30A unit with a synchronous cable (N-108, N-109, N-110, and N-111) for the ESYN-30A. For details, refer to "3. HOW TO USE ESYN-30A."
(v) OUT Connector	Connect the "IN Connector" of the another ESYN-30A unit with a synchronous cable (N-108, N-109, N-110, and N-111) for the ESYN-30A. For details, refer to "3. HOW TO USE ESYN-30A."
(vi) GND terminal	Screw (M3) for the GND terminal.

NOTE

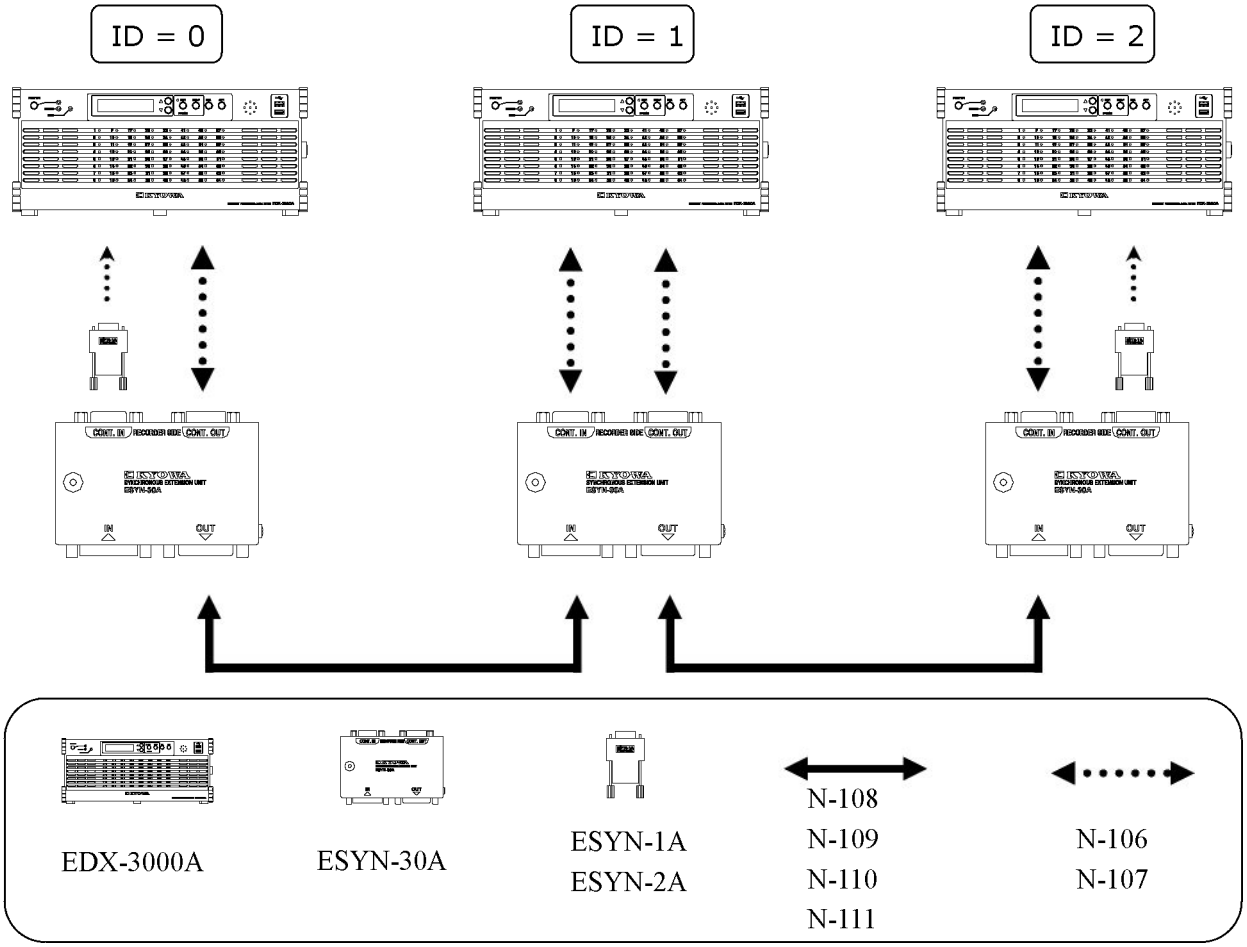
● Protective Grounding

Do not forget to connect the protective ground terminal. Or, electrical shock hazard, deteriorated performance, and damage of the product may result.

3. HOW TO USE ESYN-30A

3-1 HOW TO USE ESYN-30A

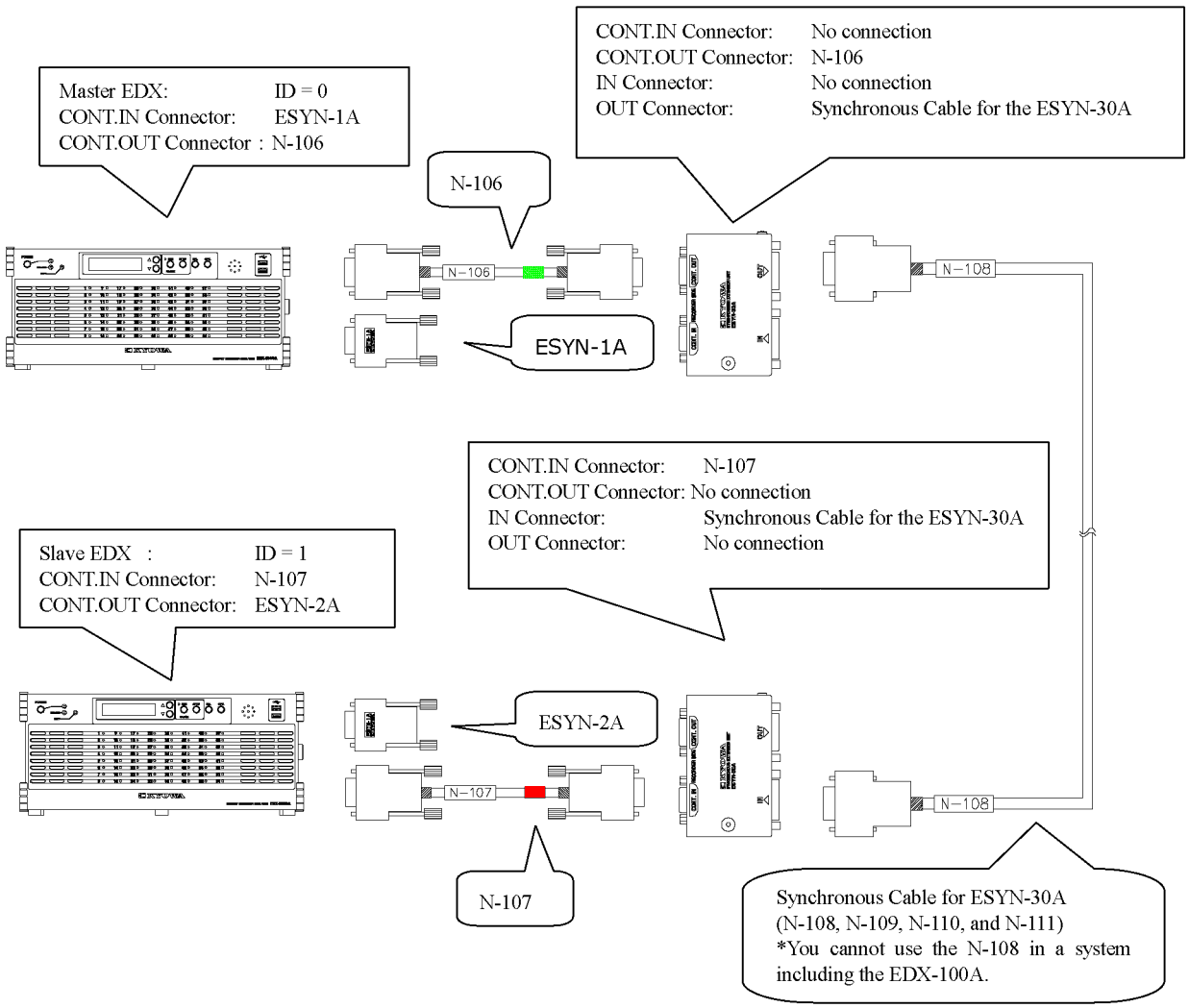
Connect the ESYN-30A to the target EDX with the IN Cable (N-107) or OUT Cable (N-106) first and connect a synchronous cable (N-108, N-109, N-110, and N-111) for the ESYN-30A between ESYN-30A units. In addition, connect the Terminator Connector M (ESYN-1A) to the EDX (ID = 0) and connect the Terminator Connector S (ESYN-2A) to the EDX (largest ID No.) For details, refer to "**3-2 SYSTEM CONFIGURATION METHOD**."



3-2 SYSTEM CONFIGURATION METHOD

3-2-1 Synchronous Operation with Two (2) Units

To extend a distance between the two (2) EDX units, connect the ESYN-30A units to the master EDX (ID = 0) and to the slave EDX (ID = 1) respectively. Then, connect ESYN-30A units with the Synchronous Cable for the ESYN-30A (N-108, N-109, N-110, N-111.) In addition, connect the Terminator Connector M (ESYN-1A) to the master EDX (ID = 0) and connect the Terminator Connector S (ESYN-2A) to the slave EDX (ID = 1.)



NOTE

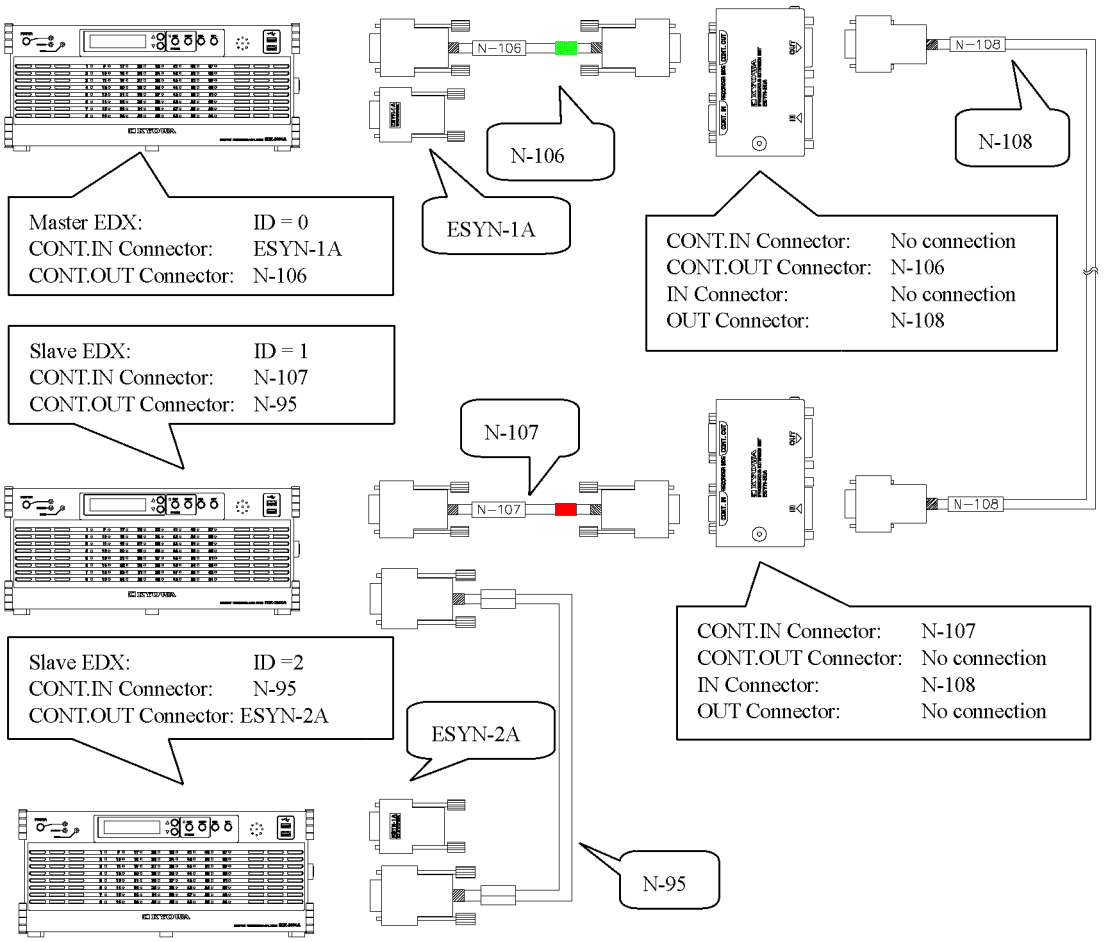
- Be sure to turn OFF the EDX before connecting.
- When the EDX-3000A and EDX-100A are mixedly used in a synchronous operation system, use the EDX-3000A as the master EDX with ID = 0.
- For every EDX, allocate serial numbers from 0 in the connecting order as ID numbers.

3-2-2 Synchronous Operation with Three (3) Units or More

When synchronous operating with 3 or more EDX units, connect the ESYN-30A units to the target EDX units to extend a distance between the target two (2) EDX units. In addition, connect the Terminator Connector M (ESYN-1A) to the master EDX (ID = 0) and connect the Termination Connector S (ESYN-2A) to the slave EDX (largest ID No.).

Example of system configuration 1: Synchronous operation with three (3) units
Synchronous cable length between the master EDX (ID = 0) and slave EDX (ID = 1) is 100 m
Synchronous cable length between the slave EDX (ID = 1) and slave EDX (ID = 2) is 2 m

Connect the ESYN-30A units to the master EDX (ID = 0) and slave EDX (ID = 1) respectively. In addition, after connecting the ESYN-1A to the master EDX (ID = 0) and ESYN-2A to the slave EDX (ID = 2) respectively, connect ESYN-30A units with synchronous cables (N-108) of 100 m for the ESYN-30A. Connect the slave EDX (ID = 1) and slave EDX (ID = 2) with the synchronous cable (N-95) of 2 m without using the ESYN-30A.



MEMO

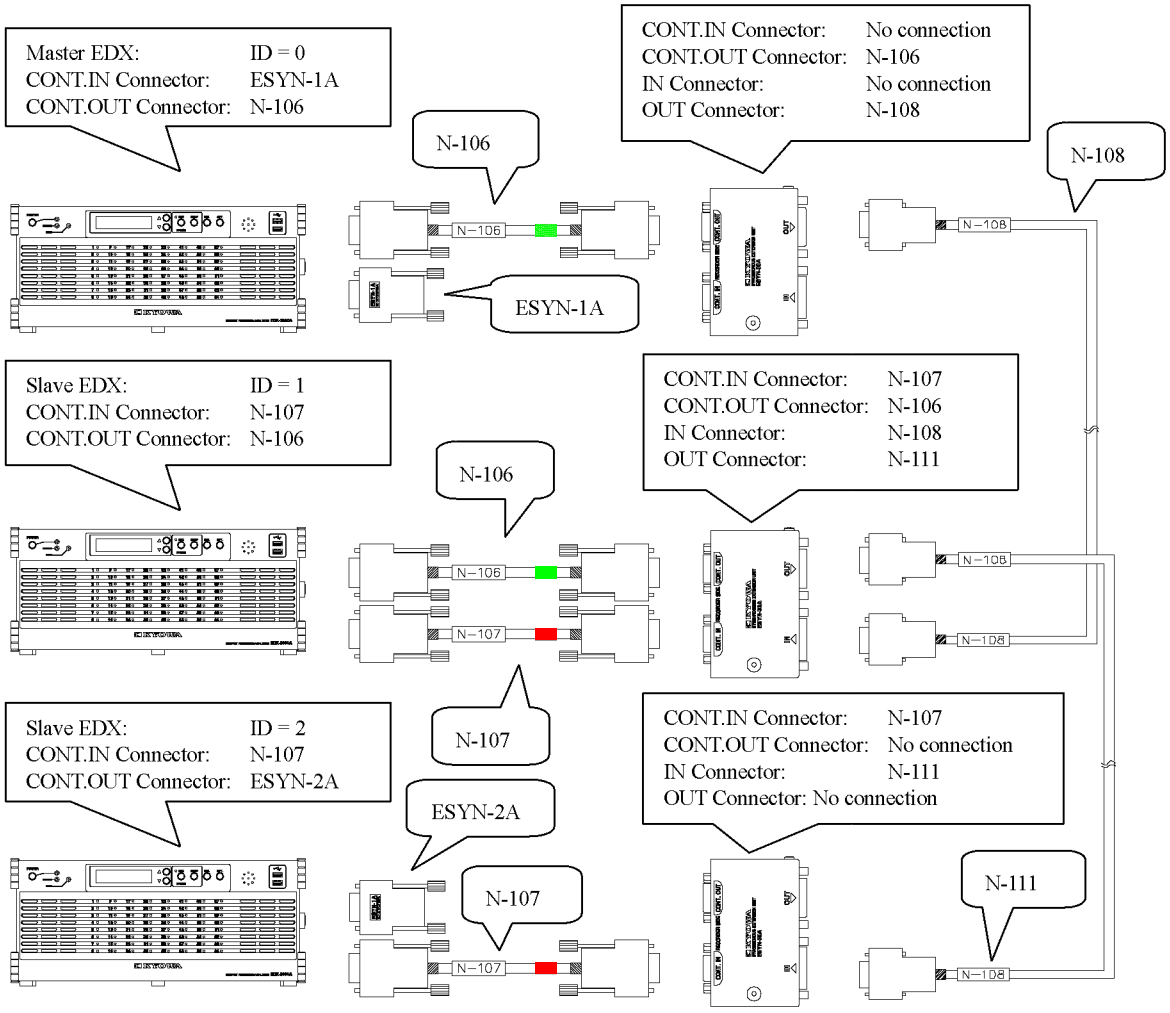
- Total length of synchronous cables is the sum of all synchronous cables for ESYN-30A.
  Total length of synchronous cables is 100 m in the above example 1. Synchronous cable (N-95) of 2 m is not included.

Example of system configuration 2: Synchronous operation with three (3) EDX units

Synchronous cable length between the master EDX (ID = 0) and slave EDX (ID = 1) is 100 m

Synchronous cable length between the slave EDX (ID = 1) and slave EDX (ID = 2) is 50 m

Connect the ESYN-30A units to the master EDX (ID = 0), slave EDX (ID = 1) and slave EDX (ID = 2) respectively. In addition, connect the Terminator Connector M (ESYN-1A) to the master EDX (ID = 0) and connect the Terminator Connector S (ESYN-2A) to the slave EDX (ID = 2) first. Then, connect the ESYN-30A of the master EDX (ID = 0) and ESYN-30A of the slave EDX (ID = 1) with the Synchronous Cable (N-108) of 100 m for ESYN-30A and connect the ESYN-30A of the slave EDX (ID = 1) and ESYN-30A of the slave EDX (ID = 2) with the Synchronous Cable (N-111) of 50 m for ESYN-30A.

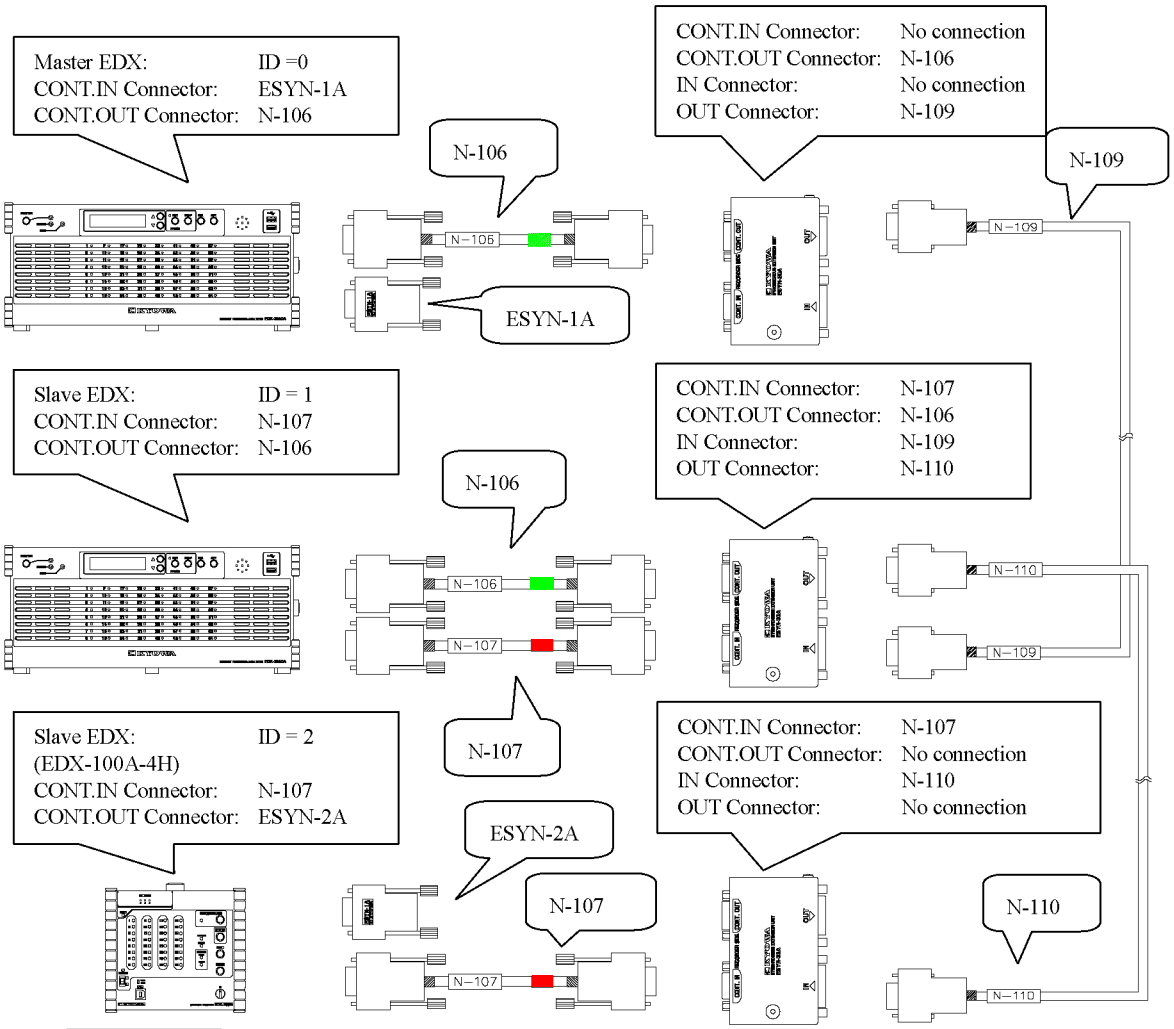


MEMO

- Total length of synchronous cables is the sum of all synchronous cables for ESYN-30A.
  Total length of synchronous cables is 150 m in the above example 2.

Example of system configuration 3: Synchronous operation with three (3) EDX units including the EDX-100A
Synchronous cable length between the master EDX (ID = 0) and slave EDX (ID = 1) is 10 m
Synchronous cable length between the slave EDX (ID = 1) and slave EDX (ID = 2) is 20 m

Connect the ESYN-30A units to the master EDX (ID = 0), slave EDX (ID = 1), and slave EDX (ID = 2) respectively. In addition, connect the Terminator Connector M (ESYN-1A) to the master EDX (ID = 0) and connect the Terminator Connector S (ESYN-2A) to the slave EDX (ID = 2.) After that, connect the ESYN-30A of the master EDX (ID = 0) and ESYN-30A of the slave EDX (ID = 1) with the Synchronous Cable (N-109) of 10 m for the ESYN-30A and connect the ESYN-30A of the slave EDX (ID = 1) and ESYN-30A of the slave EDX (ID = 2) with the Synchronous Cable (N-110) of 20 m for the ESYN-30A.



MEMO

- Total length of synchronous cables is the sum of all synchronous cables for ESYN-30A.
  Total length of synchronous cables is 30 m in the above example 3.

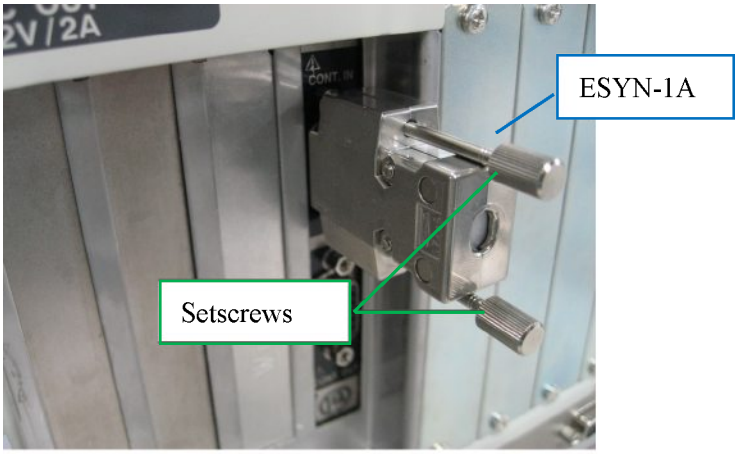
NOTE

- If the EDX-100A is included in the target system, total length of synchronous cables should be 50 m or less. For details, refer to "5. HARDWARE SPECIFICATIONS."
- ID numbers of the EDX-100A units should larger than that of the EDX-3000A units.

3-3 HOW TO CONNECT ESYN-1A/ESYN-2A

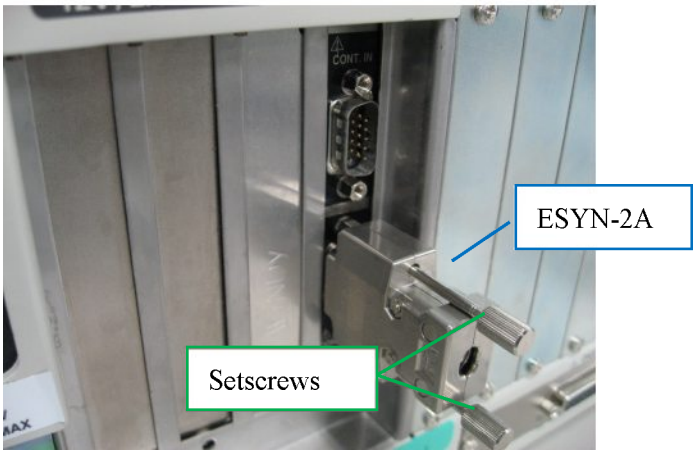
3-3-1 Connecting Terminator Connector M (ESYN-1A)

Connect the Terminator Connector M (ESYN-1A) to the "CONT. IN Connector" of the master EDX. After connecting, be sure to tighten the setscrews in a clockwise direction.



3-3-2 Connecting Terminator Connector S (ESYN-2A)

Connect the Terminator Connector S (ESYN-2A) to the "CONT. OUT Connector" of the slave EDX (having the largest ID No. in the target system.) After connecting, be sure to tighten the setscrews in a clockwise direction.



3-4 HOW TO CONNECT ESYN-30A

For connecting the ESYN-30A to the EDX, use the OUT cable (N-106) or IN cable (N-107.)

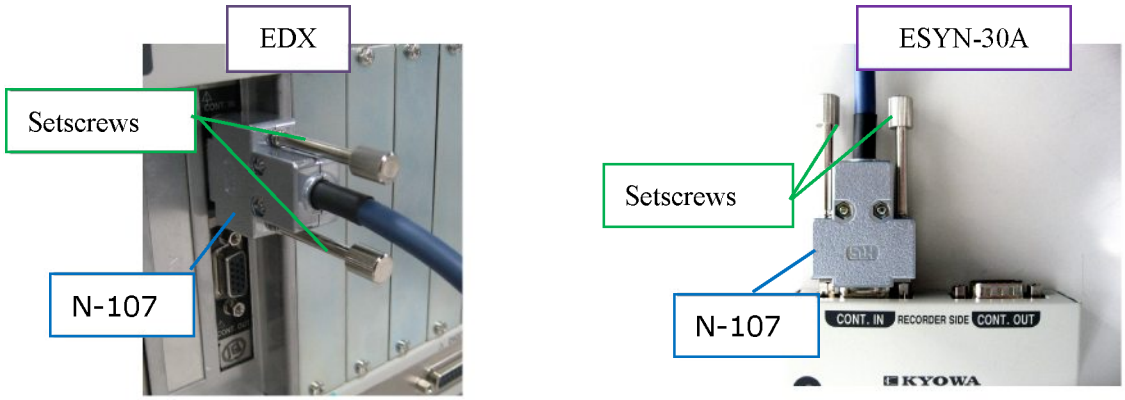
To extend the synchronous cable length between two (2) EDX units, connect the N-106 to the EDX (having smaller ID No.) first and the ESYN-30A. At this time, connect the "CONT. OUT Connectors" of the EDX and ESYN-30A with the N-106. Connect the N-107 to the EDX (having larger ID No.) and the ESYN-30A. At this time, connect the "CONT. IN Connectors" of the EDX and ESYN-30A with the N-107.
For details, refer to "**3-2 SYSTEM CONFIGURATION METHOD**."

3-4-1 How to Connect OUT Cable (N-106)

For connecting the OUT Cable (N-106), be sure to tighten the setscrews in a clockwise direction.

3-4-2 How To Connect IN Cable (N-107)

For connecting the IN Cable (N-107), be sure to tighten the setscrews in a clockwise direction.



MEMO

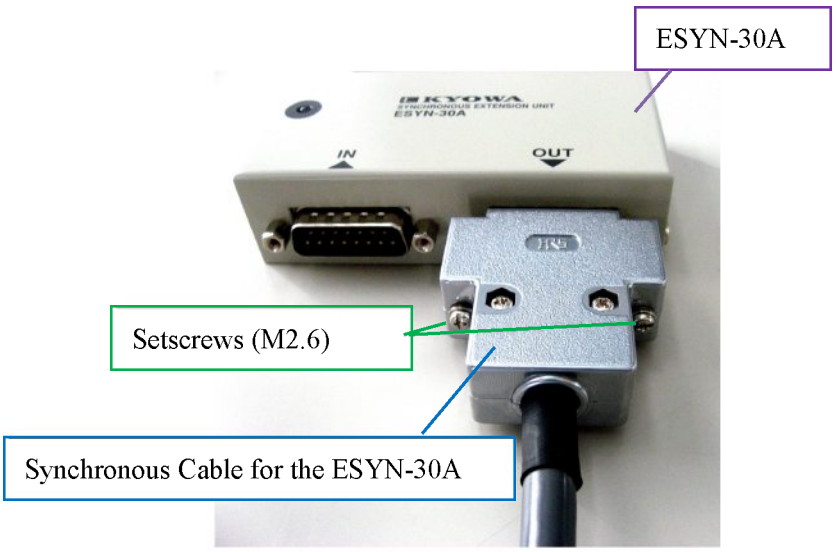
- For the slave EDX (ID = 1) of the **Example of system configuration 2** in "**3-2-2 Synchronous Operation with Three (3) Units or More**," both N-106 and N-107 are connected to the slave EDX (ID = 1) and ESYN-30A.

3-5 HOW TO CONNECT SYNCHRONOUS CABLE FOR ESYN-30A

For connecting the ESYN-30A units that are connected to the EDX units, use the Synchronous Cable for the ESYN-30A (N-108 cable, N-109 cable, N-110 cable, and N-111 cable.)

To extend the synchronous cable length between two (2) EDX units, connect the "OUT Connector" of the ESYN-30A connected to the EDX (smaller ID No.) and connect the "IN Connector" of the ESYN-30A connected to the EDX (larger ID No.) with the Synchronous Cable for the ESYN-30A.
For details, refer to "**3-2 SYSTEM CONFIGURATION METHOD**."

For connecting the Synchronous Cable for the ESYN-30A to the ESYN-30A, be sure to fasten the setscrews in a clockwise direction with a Phillips screwdriver (tip size No. 1.)



NOTE

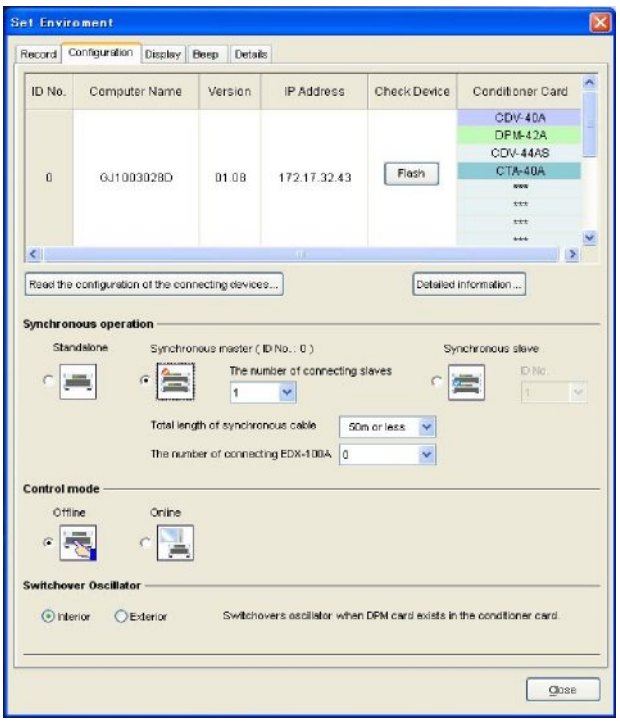
- Be sure to fasten the setscrews.
  Or, disconnected cable will cause a communication error between the EDX units.

4. HOW TO SET EDX-3000A AND EDX-100A

4-1 HOW TO SET EDX-3000A

4-1-1 How to Set EDX-3000A With EDX-3000A Software

① After configuring a system, turn ON every EDX-3000A in the system.
② Click **File** – **Environment…** or **Environment** icon on the toolbar of the EDX-3000A software to display **Set Environment** window.
③ Click **Configuration** tab and click **Offline** in the **Control mode** for setting.



④ For the master EDX, click **Synchronous master (ID No.: 0)** in the **Synchronous operation**. Then, select the target number of **The number of connecting slaves** and **The number of connecting EDX-100A** from the listboxes.
⑤ Select the target number of **Total length of synchronous cable** from the listbox.
- Synchronous operation system without using the EDX-100A

  Select longer cable length than the current total length of synchronous cables from **50 m or less**, **500 m or less** or **1000 m or less**.
- Synchronous operation system with the EDX-100A

  Select **50 m or less** from the listbox of the **Total length of synchronous cable**.

  If **500 m or less** or **1000 m or less** is selected, the software recognizes **The number of connecting EDX-100A = 0** and it may cause a connection error.

⑥ For the slave EDX, click **Synchronous slave**. Select the target number of **ID No.**, **Total length of synchronous cable** and **The number of connecting EDX-100A**.
Note that **Total length of synchronous cable** and **The number of connecting EDX-100A** of the slave EDX should be the same with that of the master EDX.
⑦ For details of the **Switchover Oscillator**, see "**4-3 OSCILLATOR SETTING**."

4-1-2 How to Set EDX-3000A With DCS-100A

① After configuring a system, turn ON every EDX-3000A in the system.
In addition, after setting ID numbers, turn ON every EDX-100A unit.

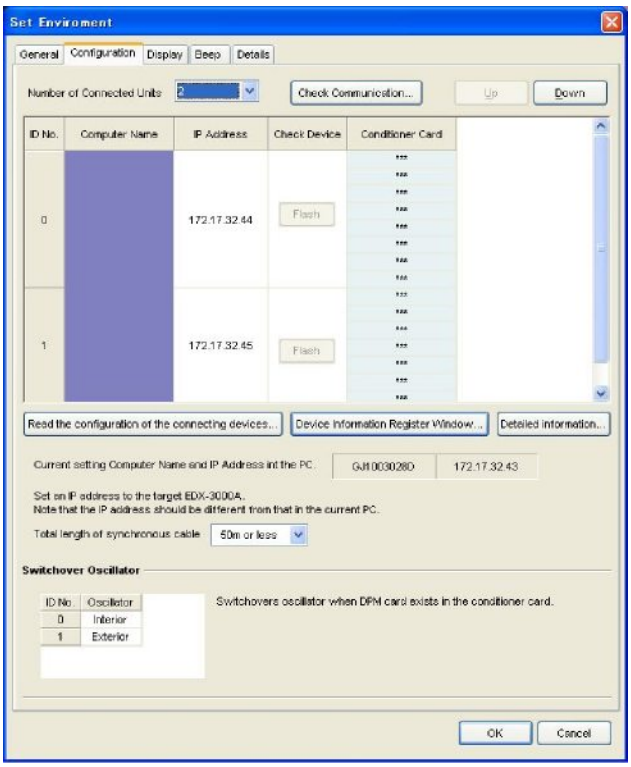
② Click **Online** in the **Control mode** of every EDX-3000A in the system.

③ Connect a PC (with the DCS-100A installed) and all EDX-3000A units and EDX-100A units in the system on the same network.

④ Start up the DCS-100A and click the **EDX-3000A** icon.

⑤ Click **File** – **Environment** or **Environment** icon on the toolbar of the DCS-100A to display **Set Environment** window.

⑥ Click **Configuration** tab and click **Read the configuration of the connecting devices…** .



⑦ Set **Total length of synchronous cable** in the **Configuration** tab.

- Synchronous operation system without using the EDX-100A
  Select longer cable length than the current total length of synchronous cables from the listbox of **Total length of synchronous cable.**
- Synchronous operation system with the EDX-100A
  Total length of synchronous cable is **50 m or less** fixed.

⑧ For details of the **Switchover Oscillator**, see "**4-3 OSCILLATOR SETTING**."

4-2 HOW TO SET EDX-100A

4-2-1 For Synchronous Operation System Including EDX-3000A

① See "**4-1-2 How to Set EDX-3000A With DCS-100A.**"

4-2-2 For Synchronous Operation System with EDX-100A Units Only

① After setting ID numbers of every EDX-100A in a system, turn ON every EDX-100A.

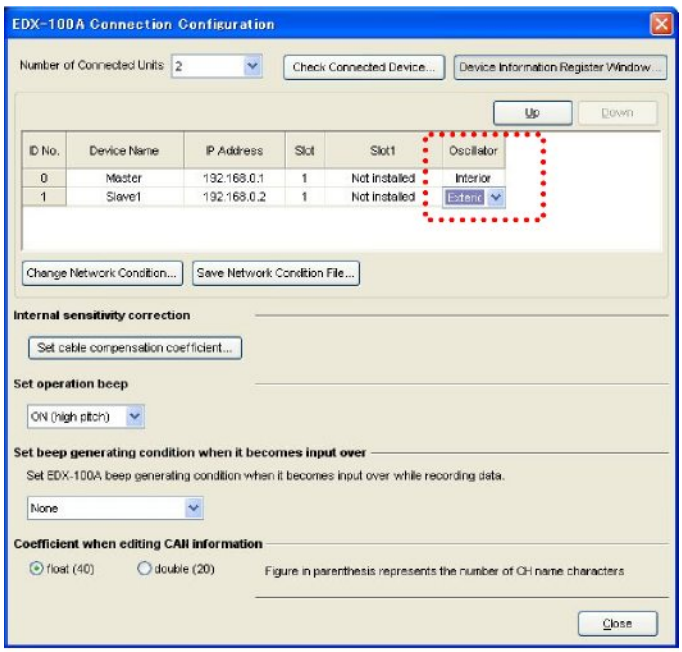
② For using the LAN interface, connect a PC (with the DCS-100A installed) and all EDX units in the system on the same network.
For using the USB interface, connect the PC and every EDX-100A with an USB cable.

③ Start up the DCS-100A and click the **EDX-100A** icon.

④ Click **File** – **Environment** or **Environment** icon on the toolbar of the DCS-100A to display **Set Environment** window.

⑤ Click **General** tab on the **Set Environment** window and click **Set Connection Configuration** button to display **EDX-100A Connection Configuration** window.

⑥ Click **Check Connected Device…** button on the **EDX-100A Connection Configuration** window.



⑦ For details of the Oscillator in , see 4-3 SETTING OSCILLATOR.

4-3 SETTING OSCILALTOR

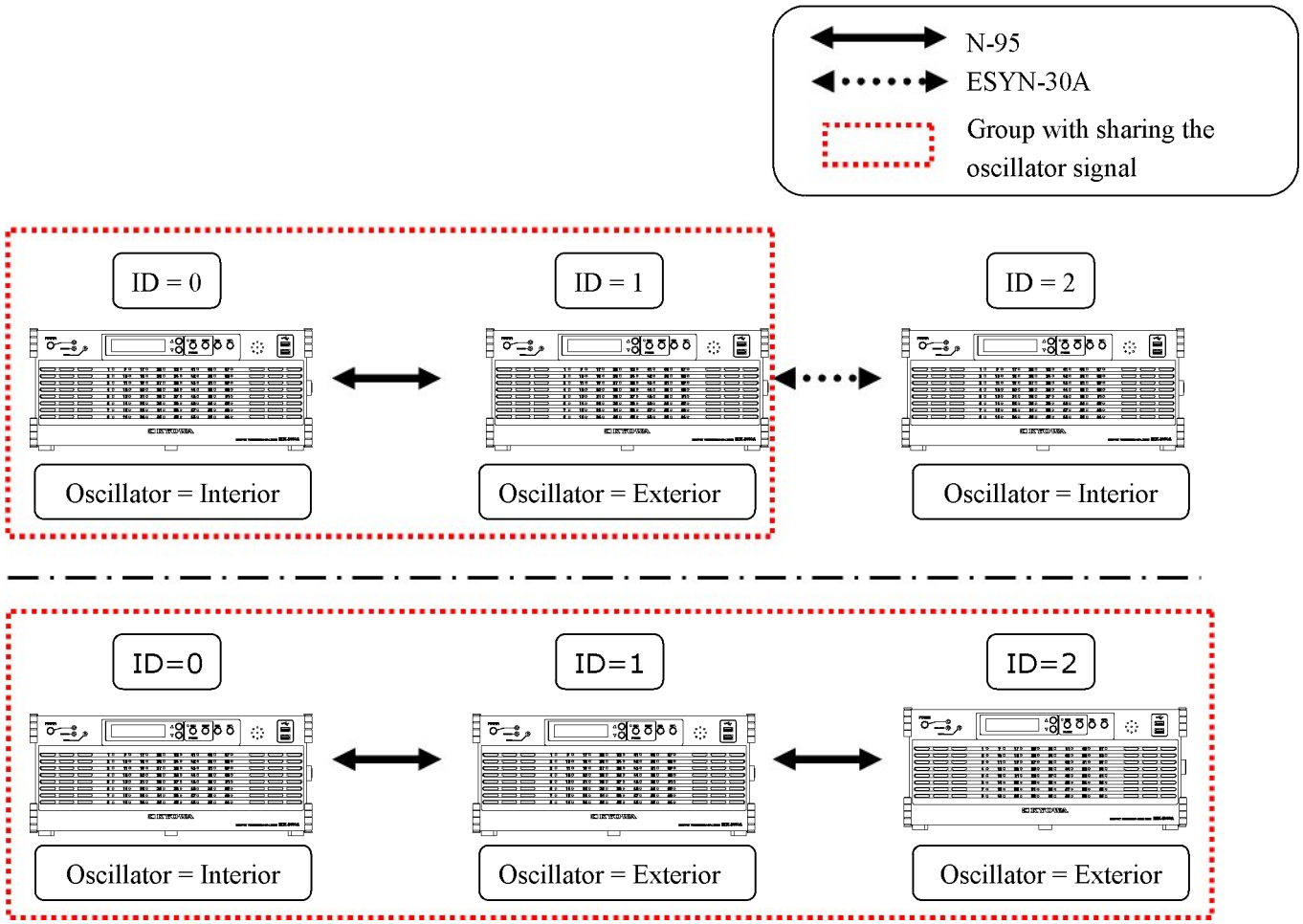
Setting oscillators are required when a DPM card is mounted to the EDX in the target system.

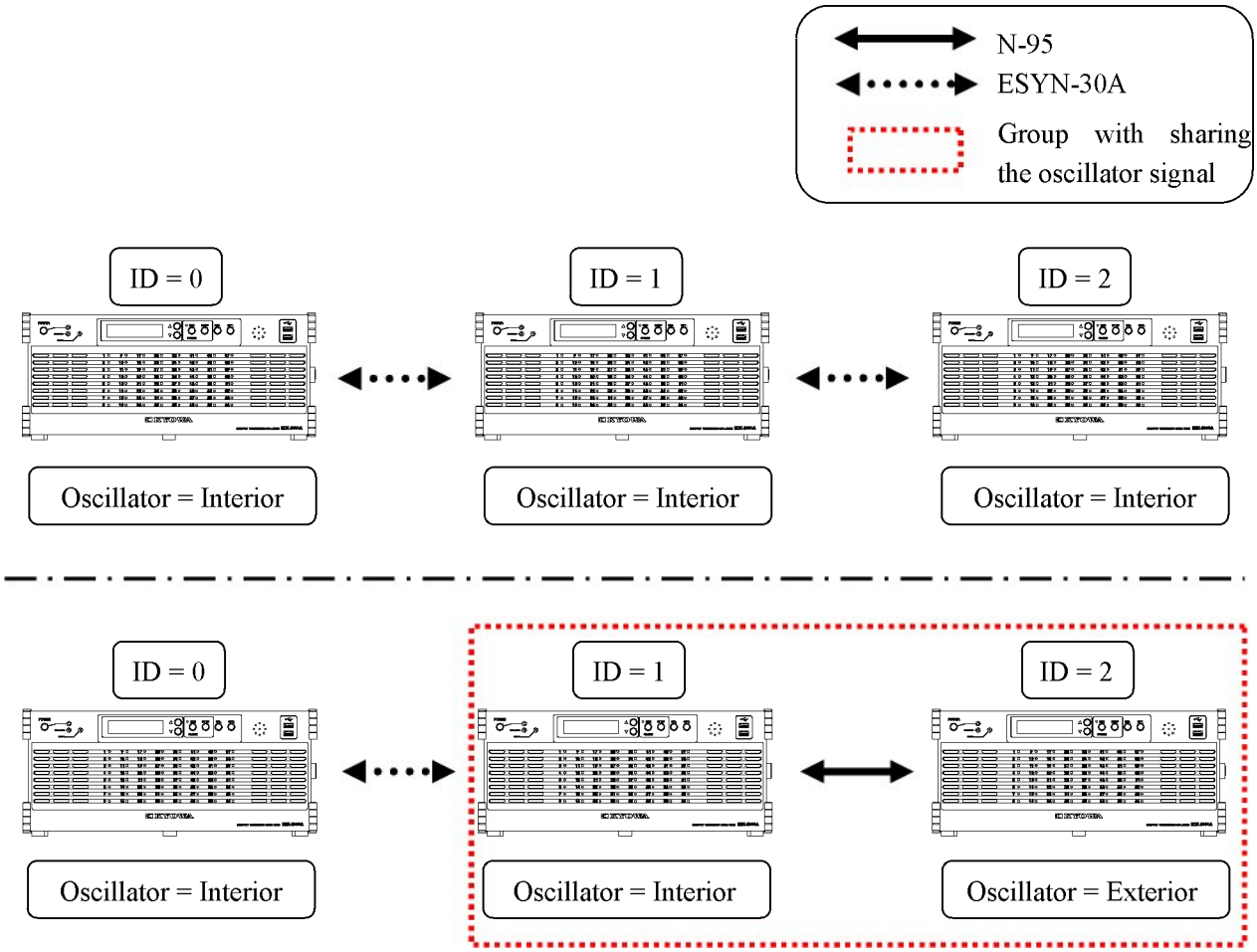
Select **Interior** or **Exterior** as follows.

- Though oscillator signal can be transferred via the synchronous cable (N-95) of 2 m, if the ESYN-30A is used, the signal cannot be transferred.

- Oscillator signal is shared between multiple EDX units connected with the synchronous cable (N-95) of 2 m. You should set only one (1) oscillator to **Internal** in a group with the sharing oscillator signal. Set oscillators of other EDX units in the group to **External**.

- Other than the above, set all oscillators to **Interior**.




N-95
ESYN-30A
Group with sharing the oscillator signal
ID = 0
ID = 1
ID = 2
Oscillator = Interior
Oscillator = Interior
Oscillator = Interior
ID = 0
ID = 1
ID = 2
Oscillator = Interior
Oscillator = Interior
Oscillator = Exterior

5. HARDWARE SPECIFICATIONS

(1) Model	ESYN-30A
(2) Display	POWER LED Connecting the EDX-3000A: Green Connecting the EDX-100A: Orange
(3) Number of connectable units	Synchronous operation with EDX-3000A units only: Max. 10 units Synchronous operation with EDX-100A units only: Max. 8 units Synchronous operation with EDX-3000A and EDX-100A※1: Max. 8 units
(4) Total length of synchronous cables※2	Synchronous operation with EDX-3000A units only: 1000 m or less Synchronous operation with EDX-100A units only: 50 m or less Synchronous operation with EDX-3000A and EDX-100A※1: 50 m or less
(5) Synchronous cable length between units	Synchronous operation with EDX-3000A units only: 100 m or less Synchronous operation with EDX-100A units only: 50 m or less Synchronous operation with EDX-3000A and EDX-100A※1: 50 m or less
(6) Operating temperature range	0 to 50℃
(7) Outside dimensions	92 mm (W) × 24.6 mm (H) × 55 mm (D) (Excluding protrusion)
(8) Weight	250 g or less

Note)

*1 Use the EDX-3000A as the master EDX (ID = 0.)
ID numbers of the EDX-100A should be larger than that of the EDX-3000A.

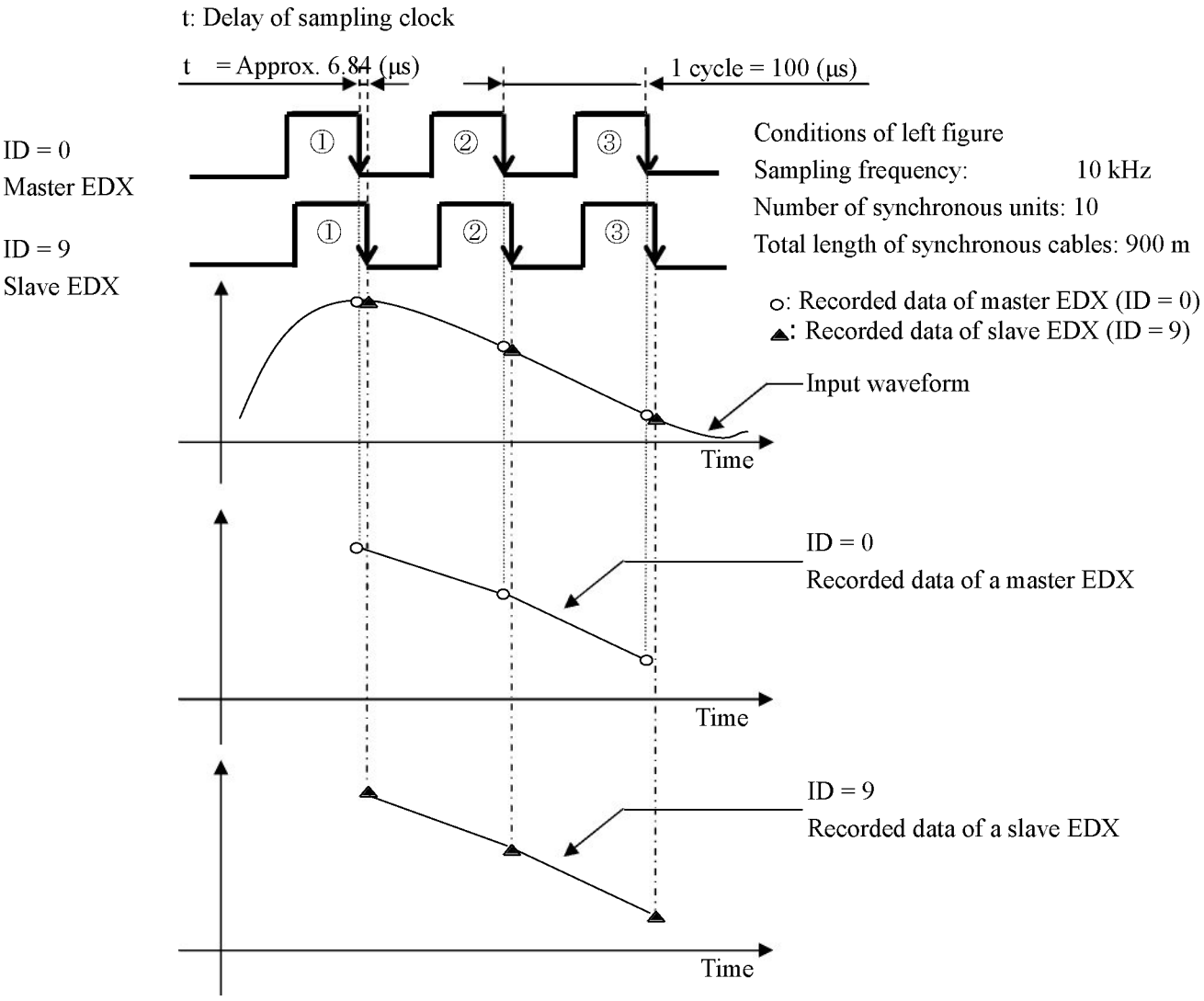
*2 Cable length of the synchronous cable (N-95) of 2 m in a system is not included.

6. DATA RECORDING TIMING

For synchronous operating the EDX units, both master EDX and slave EDX start data recording when sampling clocks fall. However, when the ESYN-30A is used in a system, due to effects of cable length of synchronous cables, etc., falling timing of sampling clocks between the master EDX and slave EDX have time lag.

6-1 TIME LAG OF DATA RECORDING START TIME

Suppose both master EDX and slave EDX start recording data at falling edge of the sampling clock as the following figure ①. The "t" in the following figure is time lag of recording starting time between the master EDX and slave EDX and it is the delay of sampling clock.
Suppose ten (10) EDX-3000A units are conducting synchronous operation in a system, every synchronous cable between the EDX-3000A units is 100 m and total length of synchronous cables is 900 m.
If you input the same input signal to the master (ID = 0) and slave (ID = 9) and start recording data, the sampling clock of the slave (ID = 9) delays approx. 6.84 μs because of extension cables. However, the number of recorded data items in every EDX-3000A in the system is same.



6-2 HOW TO CALCULATE DELAY TIME OF SAMPLING CLOCK

Delay of sampling clock is produced by the following items (1) and (2.)

(1) Signal is delayed because of a synchronous cable for the ESYN-30A (N-108, N-109, N-110, N-111)

Signal delay of approx. 0.006 (μs) is produced /1 m of the synchronous cable for the ESYN-30A. In addition, since cable length of OUT cable (N-106), IN cable (N-107), and synchronous cable (N-95) of 2 m have little effect on the signal delay, you can ignore the effect.

(2) Sampling clock signal is delayed because it passes through the ESYN-30A

If the ESYN-30A is used, signal is input to the CONT.OUT connector and is outputted from the OUT connector. In addition, signal is input to the IN connector and is outputted from the CONT.IN connector.

Every time sampling clock signals pass through the ESYN-30A (input from the CONT. OUT connector and output from the OUT connector or input from the IN connector and output from the CONT. IN connector), signal delay of approx. 0.080 (μs) is produced.

According to (1) and (2), delay (t) of the sampling clock is obtained with the following (a.)

t = Synchronous cable length (m) × 0.006 (μs)

+ Number of times that signal pass through the ESYN-30A ×0.080 (μs) ・・・ (a)

In the following figure,

Total length of synchronous cables: 150 m

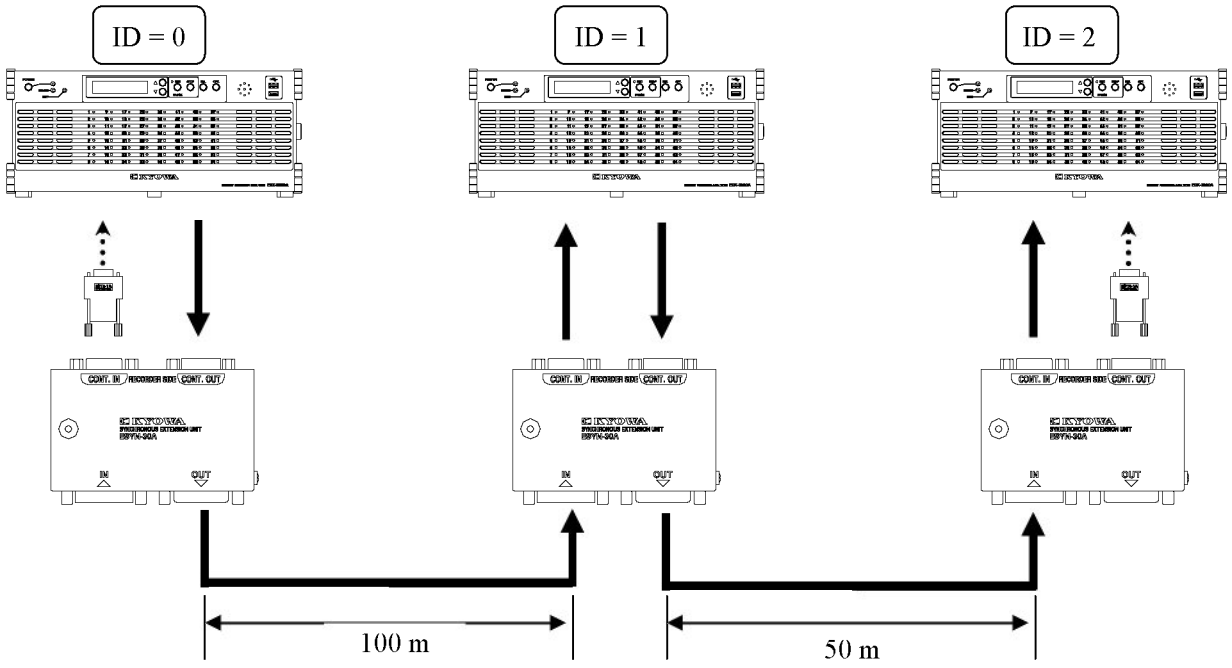
Number of times that signal pass through the ESYN-30A: 4 times

Sampling clock's delay (t) of the slave EDX (ID=2) is obtained as follows.

t = 150 × 0.006 (μs) ＋ 4 × 0.080 (μs)

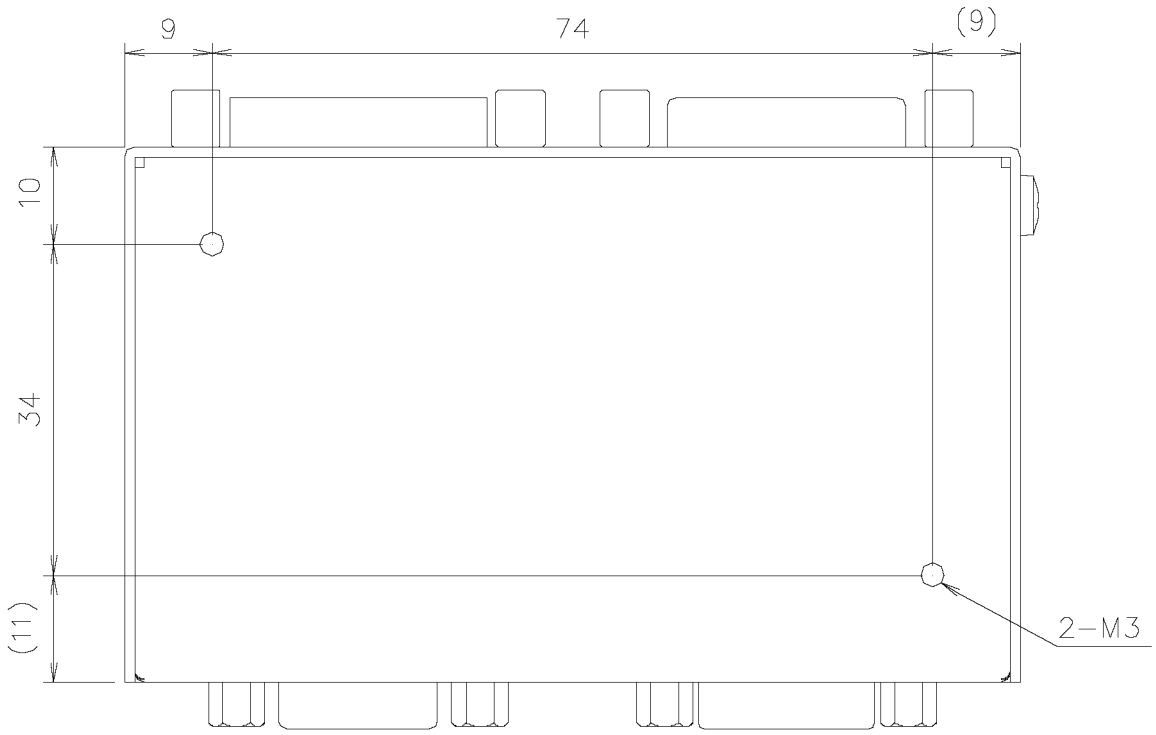
= 1.22 (μs)

Recording start times between the master (ID = 0) and slave (ID = 2) have time lag of approx. 1.22 (μs.)



7. SCREW HOLES ON BOTTOM PANEL

There are two (2) screw holes for M3 on the bottom panel of the ESYN-30A. These screw holes are for fixing the ESYN-30A.



Unit: mm

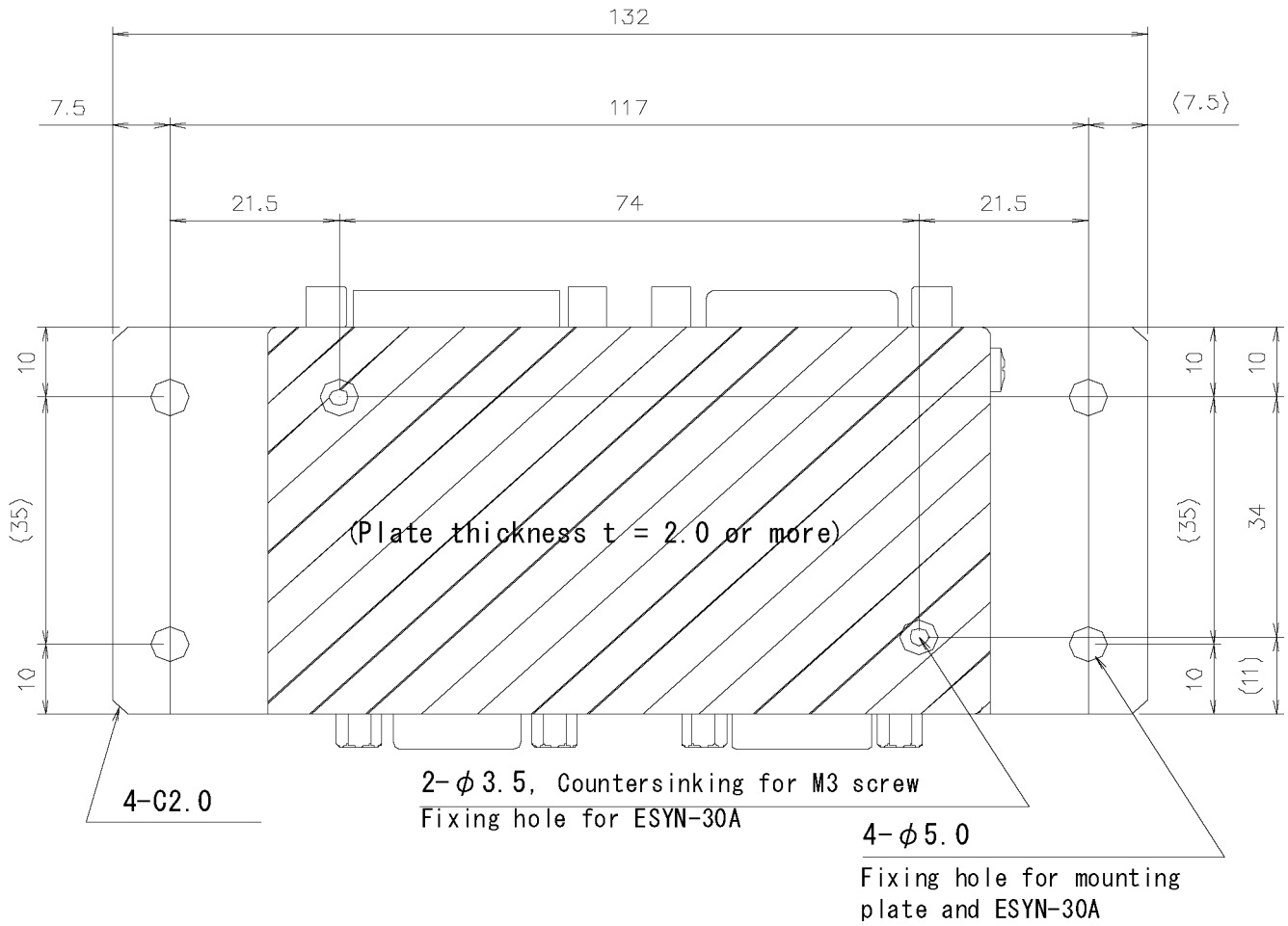
NOTE

- Screw dimensions: M3 × screw depth of 8mm
  Screws should be 8 mm or less. Or, the ESYN-30A may be damaged.

8. EXTERNAL VIEW AND DIMENSIONS OF MOUNTING PLATE FOR ESYN-30A

The following figure is an example when mounting the ESYN-30A to the mounting plate with the screw holes on the bottom panel of the ESYN-30A.

For mounting the following mounting plate to the ESYN-30A, use two (2) countersunk head screws (M3) with length [plate thickness t ＋ (4 to 8) mm](For plat thickness of 2 mm, screw length should 6 to 10 mm.)

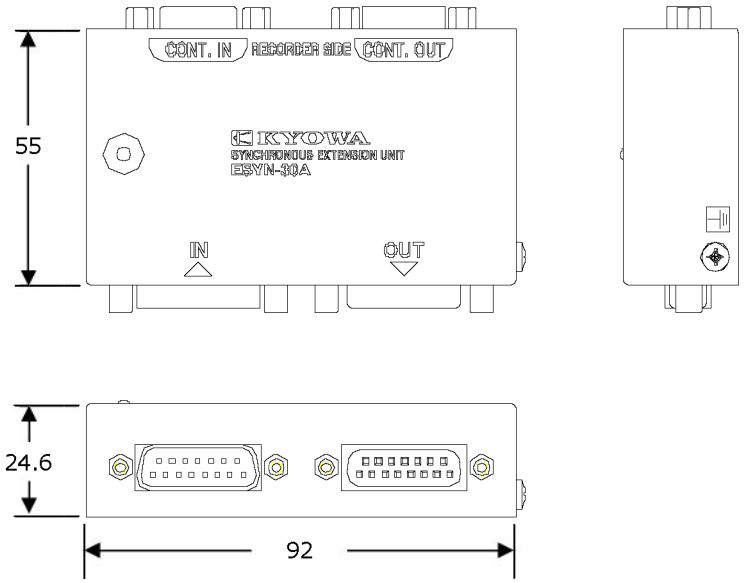


*Shaded area indicates the ESYN-30A.

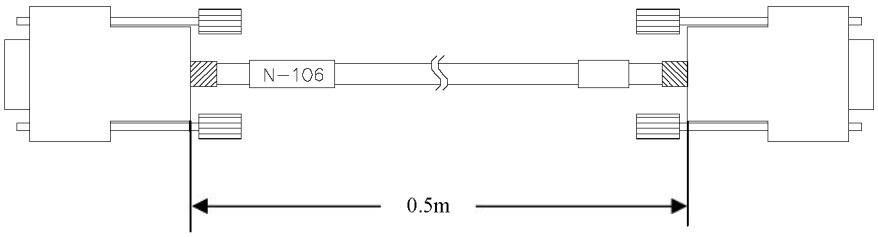
Unit: mm

9. EXTERNAL VIEW

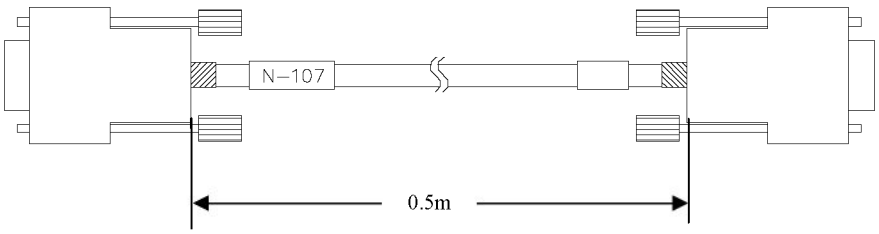
ESYN-30A (Unit: mm)



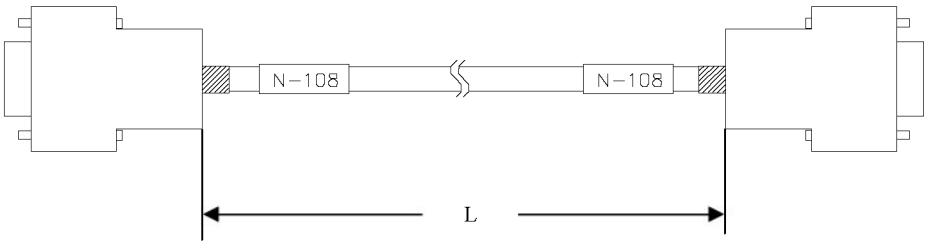
N-106 cable



N-107 cable

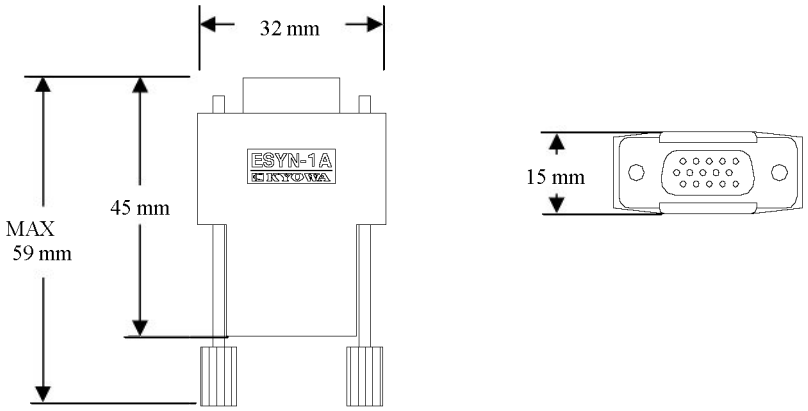


N-108 cable, N-109 cable, N-110 cable, and N-111 cable



L
- N-108: 100 m
- N-109: 10 m
- N-110: 20 m
- N-111: 50 m

ESYN-1A



ESYN-2A