# Exhibit C - Measurement Report

**Industrial Technology Research Institute**
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# ELECTROMAGNETIC INTERFERENCE TEST REPORT

Company : ZyXEL COMMUNICATIONS CORPORATION.
Address : NO.6, Innovation Rd. II,Science- Based Industrial Park, Hsin-Chu, Taiwan , R.O.C
Sample Name : ISDN Hub Router / Remote Access Router
Model : Prestige 100IH-U / Prestige 128IMH-U
Date Received : SEP. 30, 1998
Date Tested : OCT. 02, 1998

MEASUREMENT PROCEDURE USED :
FCC RULES AND REGULATION PART 15 SUBPART B
CLASS B OCTOBER 1996 AND ANSI C63.4 MAY 1992

WE HEREBY CERTIFY THAT: The measurements shown in the attachment were made in accordance with the procedures indicated, and the energy emitted by the equipment was found to be within the limits applicable. We assume full responsibility for the accuracy and completeness of these measurements and vouch for the qualifications of all persons taking them.

| | Name | Signature | Date |
|---|---|---|---|
| Testing Engineer | C.F.Wu/NVLAP | C. F. Wu | OCT. 19, 1998 |
| Approving Manager | Paul Y. Liau/NVLAP | Paul Y. Liau | Oct. 20, 1998 |

Notes :
1. This report will be invalid if duplicated or photocopied in part.
2. This report refers only to the specimen(s) submitted to test, and is invalid as seperately used.
3. This report is invalid without examination stamp and signature of this institute.
4. The tested specimen(s) will be preserved for thirty days from the date issued.
5. This is a NIST/NVLAP accrediated report but not constituted and endorsed by US government.

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# 1. GENERAL INFORMATION

## 1.1 DESCRIPTION OF EUT

MANUFACTURER : ZyXEL COMMUNICATIONS CORPORATION.

SAMPLE NAME : ISDN Hub Router / Remote Access Router

MODEL NUMBER : Prestige 100IH-U / Prestige 128 IMH-U

SERIAL NO. : ----------

POWER SUPPLY : 16VAC (for power adapter)

## 1.2 DESCRIPTION OF PERIPHERALS

**(1) PC**

MODEL NUMBER : NetServer LD Pro 6/180
SERIAL NUMBER : SG70100107
MANUFACTURER : HP CORP.
F.C.C. ID : ---------
POWER CORD : Unshielded , Detachable , 1.8m

**(2) MONITOR**

MODEL NUMBER : JC-1404HMA
SERIAL NUMBER : 08D00346
MANUFACTURER : NEC CORP.
F.C.C. ID : A3D5YRJC-1404HMA
POWER CORD : Unshielded , Detachable , 1.8m

**(3) KEYBOARD**

PRODUCT NUMBER : C1405C#AB0
SERIAL NUMBER : 3625M60145
MANUFACTURER : HP CORP.
F.C.C. ID : B94C1405X
POWER CABLE : +5VDC (From HP PC)

**(4) PRINTER**

MODEL NUMBER : 5152-002
SERIAL NUMBER : 0754365
MANUFACTURER : IBM CORP.
F.C.C. ID : BKM9A85152002

**(5) TELEPHONE**

MODEL NUMBER : RS-802F
SERIAL NUMBER : --------
MANUFACTURER : SWEETONE CORP.
FCC ID : ---------

**(6) PC**

MODEL NUMBER : Vectra VE 5/133 series 3
SERIAL NUMBER : SG72200521
MANUFACTURER : HP CORP.
FCC ID : B94VECTRA VE53

**(7) MONITOR**

MODEL NUMBER : 8515A01
SERIAL NUMBER : ---------
MANUFACTURER : IBM CORP.
FCC ID : ANO8515-A01

**(8) KEYBOARD**

MODEL NUMBER : E03633WLTW-C
SERIAL NUMBER : -------
MANUFACTURER : HP CORP.
FCC ID : CIGE03633

**(9) PC**

MODEL NUMBER : Vectra VE 5/133 series 3
SERIAL NUMBER : SG72200556
MANUFACTURER : HP CORP.
FCC ID : B94VECTRAVE53

**(10) MONITOR**

MODEL NUMBER : JC-1571VMA-2
SERIAL NUMBER : 6Z01162EA
MANUFACTURER : NEC CORP.
FCC ID : A3DJC-1571VMA-2

**(11) KEYBOARD**

MODEL NUMBER : E03633WLTW-C
SERIAL NUMBER : ----------
MANUFACTURER : HP CORP.
FCC ID : CIGE03633

**(12) Fast Ether Pair**

MODEL NUMBER : EN1207-TX
SERIAL NUMBER(1) : 633014578
SERIAL NUMBER(2) : 645017820
MANUFACTURER : ACCTON CORP.
FCC ID : HEDEN1207-TX

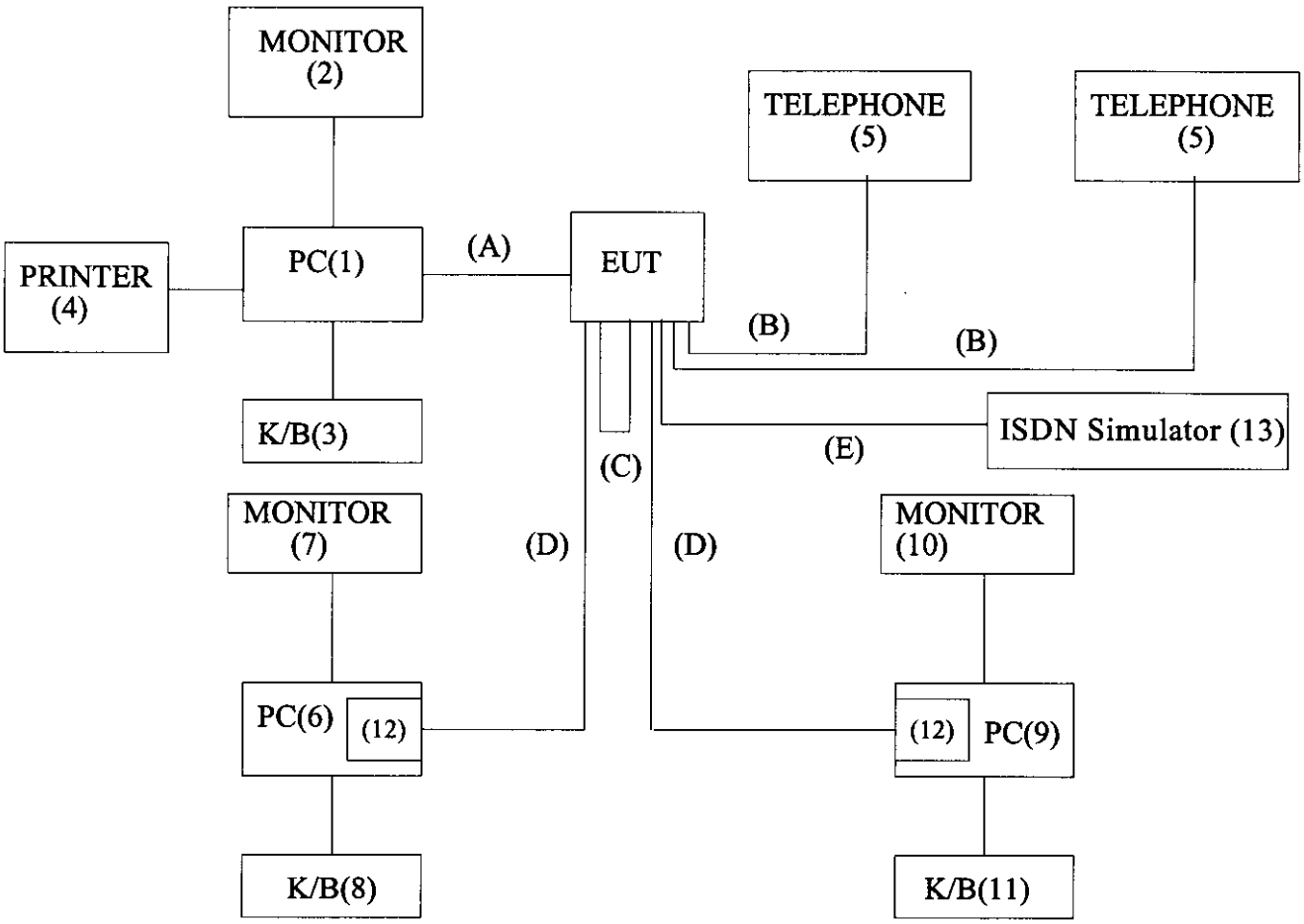
**(13) ISDN Simulator**

MODEL NUMBER : ILS-A-01
SERIAL NUMBER : 020474
MANUFACTURER : Teltone CORP.

**(14) Cable**

| NO. | TYPE | Connector | Shielded | Length |
|---|---|---|---|---|
| (A) | D Type | RS232, metal | Yes | 1.8m |
| (B) | Uncross, twisted-pair | RJ-11, plastic | No | 2m |
| (C) | Cross, twisted-pair | RJ-45, plastic | No | 2m |
| (D) | Uncross, twisted-pair | RJ-45, plastic | No | 50ft |
| (E) | Uncross, twisted-pair | RJ-11, plastic | No | 10m |

## 1.3 EUT & PERIPHERALS SETUP DIAGRAM




The indicated numbers (1)(2)-----please refer to item 1.2.

## 1.4 EUT OPERATING CONDITION

1. Powered on all equipments.
2. Ran software "PCPLUS.EXE" to communicate with EUT, then transmitted data packets back and forth.
3. Ran software "ACCTEST.EXE" for two PC'S to communicate with EUT, then sent and received data packets each other.
4. Repeated it untill test OK.

## 1.5 DESCRIPTION OF TEST SITE

SITE DESCRIPTION : FCC certificate NO. :31040/SIT
DNV certificate NO. :510-96-1016
TUV certificate NO. : I9664582-9610
Lloyd's certificate NO. :LA003
BCIQ certificate NO. :SL2-IN-E-02
NVLAP Lab code : 200118-0
CNLA certificate NO. : CNLA-ZL97018
VCCI certificate NO. : R-706, C-650

NAME OF SITE : Electronics Research & Service Organization
Industrial Technology Research Institute

SITE LOCATION : K500, 195-4 , sec. 4, Chung Hsing Rd.,
Chu-Tung Chen. Hsin-Chu, Taiwan 31015 R.O.C.

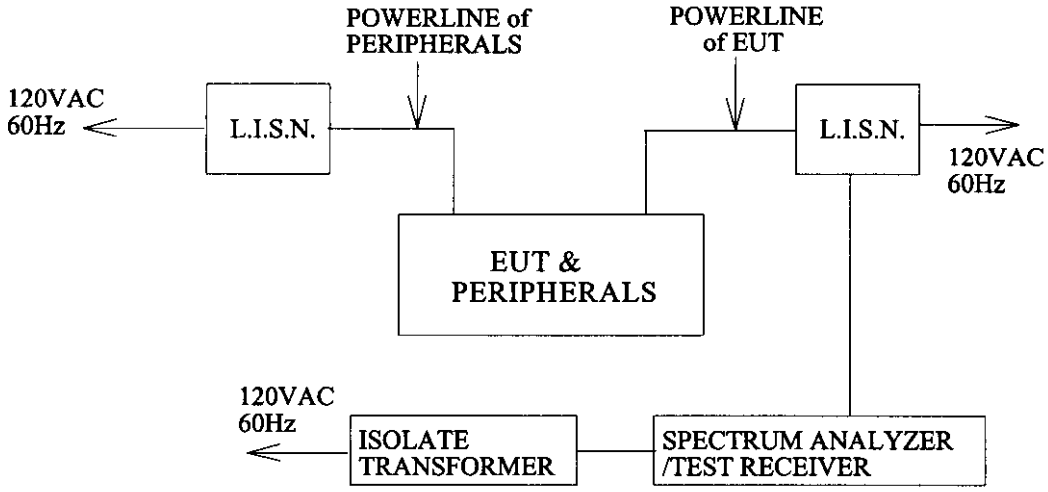
# 2. CONDUCTED POWERLINE TEST

## 2.1 TEST EQUIPMENTS

The following test equipments are used during the conducted powerline tests :

| MANUFACTURER OR TYPE | MODEL No | SERIAL NO. | DATE OF CALIBRATION |
|---|---|---|---|
| SPECTRUM ANALYZER & DISPLAY | HP 8568A | 2235A02320 | MAR. 05, 1998 |
| QUASI-PEAK ADAPTER | HP 85650 A | 2341A00672 | MAR. 05, 1998 |
| ISOLATION TRANSFORMER | SOLAR 7032-1 | N/A | N/A |
| L.I.S.N. | EMCO 3850/2 | 9311-1025<br>9401-1028 | MAR. 24. 1998 |
| TEST RECEIVER | R/S ESH3 | 8720791118 | MAR. 13, 1998 |
| SHIELDED ROOM | KEENE 5983 | N/A | N/A |

## 2.2 TEST SETUP



## 2.3 CONDUCTED POWER LINE EMISSION LIMIT

| FREQUENCY | MAXIMUM RF LINE VOLTAGE (dB $\mu$ V) | |
|---|---|---|
| (MHz) | CLASS A | CLASS B |
| 0.45 - 1.705 | 60 | 48 |
| 1.705 - 30.0 | 69.5 | 48 |

## 2.4 TEST PROCEDURE

The test procedure is performed in a 12ft × 12ft × 8ft(L × W × H) shielded room.
the EUT along with its peripherals were placed on a 1.0m(W) × 1.5m(L) and 0.8m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane. The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chasis ground was bounded to the horizontal ground plane of shielded room. All peripherals were connected to the second LISN and the chasis ground also bounded to the horizontal ground plane of shielded room. The excess power cable between the EUT and the LISN was bundled. The power cables of peripherals were unbundled. All connecting cables of EUT and peripherals were moved to find the maximum emission.

## 2.5 UNCERTAINTY OF CONDUCTED EMISSION

The uncertainty of conducted emission is ±1.36dB.

## 2.6 LINE CONDUCTED RF VOLTAGE MEASUREMENT

The frequency spectrum from 0.45 MHz to 30 MHz was investigated. All emissions not reported below are more than 20 dB below the prescribed limits.

All readings are Quasi-peak values.

Temperature : 23 ℃ Humidity : 56 % RH

| FREQUENCY | READING(dB $\mu$ V) | | LIMITS |
|---|---|---|---|
| | ONE END & GRD'D | THE OTHER END & GRD'D | (dB $\mu$ V) |
| (MHz) | Q.P. | Q.P. | Q.P. |
| 0.450 | * | * | 48.00 |
| 5.005 | 35.11 | 38.51 | 48.00 |
| 6.878 | 37.33 | 40.83 | 48.00 |
| 7.526 | 42.33 | 45.73 | 48.00 |
| 8.148 | 39.64 | 42.84 | 48.00 |
| 8.776 | 40.44 | 43.54 | 48.00 |
| 9.401 | 39.44 | 43.04 | 48.00 |
| 12.516 | * | 39.06 | 48.00 |
| 21.600 | 31.28 | 34.68 | 48.00 |
| 30.000 | * | * | 48.00 |

REMARKS : 1. * Undetectable

2. For Prestige 100IH-U

## 2.6 LINE CONDUCTED RF VOLTAGE MEASUREMENT

The frequency spectrum from 0.45 MHz to 30 MHz was investigated. All emissions not reported below are more than 20 dB below the prescribed limits.

All readings are Quasi-peak values.

Temperature : 23 ℃ Humidity : 56 % RH

| FREQUENCY | READING(dB μV) | | LIMITS |
|---|---|---|---|
| | ONE END & GRD'D | THE OTHER END & GRD'D | (dB μV) |
| (MHz) | Q.P. | Q.P. | Q.P. |
| 0.450 | * | * | 48.00 |
| 5.005 | 35.71 | 35.61 | 48.00 |
| 7.526 | 43.03 | 42.63 | 48.00 |
| 8.148 | 40.64 | * | 48.00 |
| 8.729 | 39.34 | * | 48.00 |
| 8.776 | * | 41.74 | 48.00 |
| 9.401 | 39.94 | 39.64 | 48.00 |
| 21.600 | 32.38 | * | 48.00 |
| 30.000 | * | * | 48.00 |

REMARKS : 1. * Undetectable

2. For Prestige 128IMH-U

# 3. RADIATED EMISSION TEST

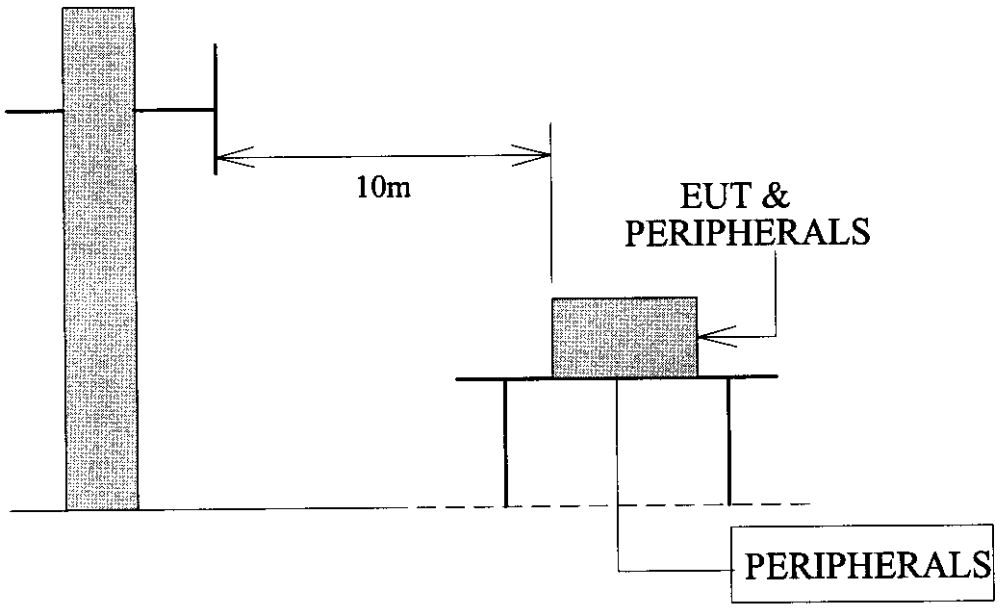
## 3.1 TEST EQUIPMENTS

The following test equipments are utilized in making the measurements contained in this report.

| MANUFACTURER OR TYPE | MODEL NO | SERIAL NO | DATE OF CALIBRATION |
|---|---|---|---|
| CHASE BI-LOG ANTENNA | CBL6111A | 1546 | MAY.23, 1998 |
| R/S TEST RECEIVER | ESMI | 842088/005<br>841978/008 | MAY.29, 1998 |
| OPEN SITE | ---------- | No.2 | AUG. 18, 1998 |

## 3.2 TEST SETUP

The diagram below shows the test setup which is utilized to make these measurements.




Antenna Elevation Variable

## 3.3 RADIATION LIMIT

All emanation from a class B computing device or system , including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified below :

| FREQUENCY (MHz) | FIELD STRENGTHS(dB $\mu$ V/M) | |
|---|---|---|
| | CLASS A(10m) | CLASS B(3m) |
| 30－88 | 39.0 | 40.0 |
| 88－216 | 43.5 | 43.5 |
| 216－960 | 46.4 | 46.0 |
| 960－1000 | 49.5 | 54.0 |

Note : (1)The tighter limit shall apply at the edge between two frequency bands.
(2)Distance refers to the distance in meters between the measuring instrument antenna and the closest point of any part of the device or system.

## 3.4 TEST PROCEDURE

The devices under test were placed on a rotatable table top 0.8 meter above ground. The table was rotated 360 degrees to determine the position of the highest radiation. EUT is set 10 meters from the interference receiving antenna which is mounted on the top of a variable height mast. The antenna height is varied between one meter and four meters above ground to find the maximum value of the field strength Both horizontal polarization and vertical polarization of the antenna are set to make the measurement.
The bandwidth setting on the E.M.I. meter (R/S TEST RECEIVER ESMI) is 120 KHz.
The levels are quasi peak value readings. The frequency spectrum from 30MHz to 1000MHz was investigated.

## 3.5 UNCERTAINTY OF RADIATED EMISSION

The uncertainty of radiated emission is $\pm$2.72dB.

## 3.6 RADIATED RF NOISE MEASUREMENT

The frequency spectrum from 30 MHz to 1000 MHz was investigated. All emissions not reported below are more than 20 dB below the prescribed limits.

All readings are quasi-peak values.

Temperature : 29 ℃ Humidity : 78% RH

| FREQ-UENCY (MHz) | ANTENNA FACTOR (dB) | CABLE LOSS (dB) | METER READING AT10m (dB μ V/M) | | LIMITS (dB μ V/M) | EMISSION LEVEL AT10m (dB μ V/M) | |
|---|---|---|---|---|---|---|---|
| | | | HORIZON-TAL | VERTICAL | | HORIZON-TAL | VERTICAL |
| 30.00 | 17.06 | 1.06 | * | * | 30.00 | * | * |
| 61.42 | 5.49 | 1.57 | 11.16 | 22.78 | 30.00 | 18.22 | 29.84 |
| 159.98 | 10.68 | 2.37 | 13.26 | 12.56 | 30.00 | 26.31 | 25.61 |
| 179.98 | 8.94 | 2.50 | 12.00 | 13.12 | 30.00 | 23.44 | 24.56 |
| 184.31 | 8.92 | 2.53 | * | 17.04 | 30.00 | * | 28.49 |
| 189.97 | 8.89 | 2.57 | 10.88 | 9.90 | 30.00 | 22.34 | 21.36 |
| 199.97 | 8.85 | 2.63 | 16.48 | 16.20 | 30.00 | 27.96 | 27.68 |
| 219.98 | 10.20 | 2.77 | * | 10.74 | 30.00 | * | 23.71 |
| 219.99 | 10.20 | 2.77 | 9.48 | * | 30.00 | 22.45 | * |
| 1000.00 | 23.69 | 6.80 | * | * | 37.00 | * | * |

REMARKS : 1. * Undetectable

2. Emission level (dB μ V/M) =Antenna Factor (dB) + Cable loss (dB) + Meter Reading (dB μ V/M).

3. For Prestige 100IH-U

## 3.6 RADIATED RF NOISE MEASUREMENT

The frequency spectrum from 30 MHz to 1000 MHz was investigated. All emissions not reported below are more than 20 dB below the prescribed limits.

All readings are quasi-peak values.

Temperature : 29 ℃ Humidity : 78% RH

| FREQ-UENCY (MHz) | ANTENNA FACTOR (dB) | CABLE LOSS (dB) | METER READING AT10m (dB μ V/M) | | LIMITS (dB μ V/M) | EMISSION LEVEL AT10m (dB μ V/M) | |
|---|---|---|---|---|---|---|---|
| | | | HORIZON-TAL | VERTICAL | | HORIZON-TAL | VERTICAL |
| 30.00 | 17.06 | 1.06 | * | * | 30.00 | * | * |
| 61.42 | 5.49 | 1.57 | 10.88 | 22.22 | 30.00 | 17.94 | 29.28 |
| 122.86 | 11.93 | 2.04 | * | 12.42 | 30.00 | * | 26.39 |
| 159.98 | 10.68 | 2.37 | 12.98 | 12.14 | 30.00 | 26.03 | 25.19 |
| 179.90 | 8.94 | 2.50 | * | 11.16 | 30.00 | * | 22.60 |
| 179.98 | 8.94 | 2.50 | 11.44 | * | 30.00 | 22.88 | * |
| 184.30 | 8.92 | 2.53 | * | 14.38 | 30.00 | * | 25.83 |
| 189.98 | 8.89 | 2.57 | 9.34 | 10.32 | 30.00 | 20.80 | 21.78 |
| 199.98 | 8.85 | 2.63 | 16.06 | 15.50 | 30.00 | 27.54 | 26.98 |
| 219.98 | 10.20 | 2.77 | 9.34 | 9.90 | 30.00 | 22.31 | 22.87 |
| 1000.00 | 23.69 | 6.80 | * | * | 37.00 | * | * |

REMARKS : 1. * Undetectable

2. Emission level (dB μ V/M) =Antenna Factor (dB) + Cable loss (dB) + Meter Reading (dB μ V/M).

3. For Prestige 128IMH-U