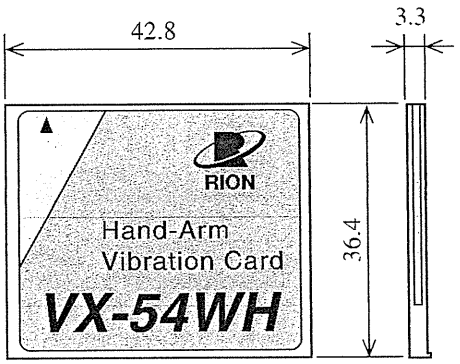
4. 仕 様

ソフトウエアの形態およびメディア

3 軸振動計 VM-54 にプログラムをインストールして使用する

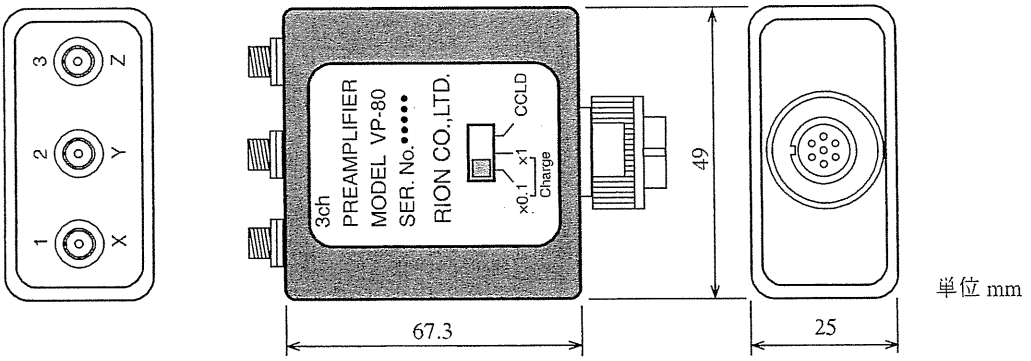
メディア： コンパクトフラッシュ

付属品	3ch 振動入力プリアンプ	VP-80	1
	シートパネル		1
	取扱説明書		1
	検査票		1
	保証書		1
別売品	3 軸振動計	VM-54	
	圧電式加速度ピックアップ	PV-97C	
		PV-93	
	延長コード	EC-04 シリーズ	
	収納ケース	CF-25	
	ソフトケース	CF-26	



単位 mm

手腕振動測定カード外形寸法図



単位 mm

3ch 振動入力プリアンプ VP-80 外形寸法図

3 軸振動計 VM-54 に手腕振動測定カード VX-54WH のプログラムをインストールしたときの仕様

適用規格

ISO 5349-1 : 2001
ISO 5349-2 : 2001
ISO/DIS 8041 : 2003
JIS B 7761-1 : 2004
JIS B 7761-2 : 2004

入力

チャンネル数 3ch
3ch 振動入力プリアンプ VP-80 により、電荷出力タイプの圧電式加速度ピックアップまたはプリアンプ内蔵型加速度ピックアップ(CCLD)が接続可能

公称測定周波数範囲

8 ～ 1000 Hz

周波数補正特性

Wh
Wh の帯域制限周波数補正特性のみがかかるフラット特性

測定機能

加速度 (m/s^2)
瞬時値 (積分時間 1 sec (τ =1 sec) の実効値)
3ch 同時測定

演算機能

RMS : 測定時間 (演算による計測時間) の実効値
MTVV : 測定時間における積分時間 1 sec (τ =1 sec) の実効値の最大値
クレストファクタ
PEAK
VDV : 振動暴露量値

$$VDV = \left\{ \int_0^T a_w^4(t)\, dt \right\}^{\frac{1}{4}}$$

$a_w(t)$: 補正加速度の瞬時値
T : 測定時間

合成振動値 : 直交軸方向振動を合成した加速度実効値

$$a_v = \sqrt{a^2_{wx} + a^2_{wy} + a^2_{wz}}$$

a_{wx}、a_{wy}、a_{wz} : 各軸の補正加速度実効値

測定時間

1～30 secの1 sec刻みおよび1 min、10 min、 30 min、 1 hour、 4 hour、8 hour、12 hour (Max12 hour)

レベルレンジ

圧電式加速度ピックアップの場合
感度の単位は、CCLD の時 mV/ (m/s^2)、Charge のとき pC/ (m/s^2)
感度設定が 0.0100 ～ 0.0999 mV/ (m/s^2) の時
30、100、300、1000、3000、10000 m/s^2
感度設定が 0.100 ～ 0.999 mV/ (m/s^2) の時
3、10、30、100、300、1000、3000、10000 m/s^2
感度設定が 1.00 ～ 9.99 mV/ (m/s^2) の時
0.3、1、3、10、30、100、300、1000 m/s^2
感度設定が 10.0 ～ 99.9 mV/ (m/s^2) の時
0.03、0.1、0.3、1、3、10、30、100 m/s^2

測定値検出回路	デジタル演算方式
表示	メイン画面(セグメントタイプ液晶) 1 方向の瞬時値または演算値、表示周期 1 sec バーグラフ、表示周期 100 msec その他設定表示 サブ画面 (128 × 64 ドットマトリクス型液晶) 3 方向瞬時値、演算結果、メニュー、リコールデータなど
ストアデータ	コンパクトフラッシュへのAuto1ストア、マニュアルストア(CSV形式で保存) Auto1 ストア: RMS 値、PEAK、VDV、クレストファクタ、合成振動値の 1 sec 毎データをストアする。 Manual ストア: ストアキーを押した時点の瞬時値、演算値(RMS 値、MTVV、クレストファクタ、VDV、PEAK、合成振動値)をストアする。
信号出力端子	BNC コネクター: X、Y、Z の 3 方向交流出力(設定した周波数特性がかかる) レンジフルスケール: 1 Vrms
I/O 端子	D-sub-9 ピンオス端子(プリンタ用出力)
プリンタ印字機能	メニュー、ポーズ中、リコールのサブ画面印字
使用温湿度範囲	-10 ～ 50℃　90%RH 以下(結露しないこと)
電源	単 2 形乾電池 4 本または AC アダプター NC-98 (別売) 動作電圧範囲　4.2 V ～ 6.7 V
電池寿命	連続 16 時間以上(アルカリ乾電池、PV-97C、VP-80 接続、バックライト Off、常温にて)

本仕様は改良のため予告なく変更することがあります。

HVLab DATA ACQUISITION AND ANALYSIS SYSTEM

Version 3.80

September 1994

User Guide and Programming Manual

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Institute of Sound and Vibration Research
University of Southampton
Southampton SO17 1BJ
England

This document has been prepared to assist users of *HVLab* equipment and software. Information in this document is subject to change without notice and does not represent a commitment on the part of the authors or the University of Southampton.

The material contained herein is believed to be correct and is supplied in good faith. The University and the authors assume no responsibility and shall have no liability of any kind arising from the supply or use of this document or the material contained herein or the software described herein.

1. INTRODUCTION

HVLab is a software package for data acquisition and analysis, running under MS-DOS on an IBM PC compatible computer. Software controlled anti-aliasing filters, analogue-to-digital converters and digital-to-analogue converters enable signals to be acquired, stored on disk in digital form and subsequently re-created in analogue form if required. The software package includes a comprehensive selection of functions for frequency analysis, digital filtering, many other operations on digital data files and the graphical display of results.

This manual contains operating instructions and programmer's information for the *HVLab* digital data acquisition and analysis system.

Sections 2 to 7 are concerned with the description of the structure and operation of the software package. Additional information is contained in the Appendices.

The hardware supplied with each system may vary depending on the requirements of the user. This section contains additional information relating specifically to your system.

1.1 System-specific Information

System Serial Number:	9410
Supplied to:	Department of Human Environment Engineering National Institute of Industrial Health 6-21-1, Nagao, Tama-Ku Kawasaki 214, Japan
Date:	October 1994
HVLab software:	Version 3.80
Data conversion:	Can be used with Advantech PCL 718/818, Metrabyte DAS 16/1402/1602 analogue interfaceboards and (optional) TECHFILTER anti-aliasing filter board

1.2 Installing the Software

The complete installation procedure is documented in Appendix 5 and Section 2 gives instructions on running the *HVLab* software.

· sec1.doc
October 1994

2. USING THE SOFTWARE - A SIMPLE GUIDE

2.0 Introduction

HVLab was originally developed for the analysis of vibration data in accordance with British and International standards concerning the evaluation of effects on humans. It is, however, suited to many other signal processing applications.

The *HVLab* software is a superset of the computer language FORTH. It contains a number of functions for the acquisition and analysis of analogue signals. There is also a full set of primitive functions (referred to as **words**) complying with the FORTH-83 standard, with additions for handling real and complex floating point numbers, strings and data files.

FORTH is interactive, so that operations can be executed directly as commands from the keyboard.

This section of the manual is intended to provide the user with a general description of the system's capabilities and contains sufficient information to allow operation of the software interactively. More detailed information can be found in later sections.

2.1 Getting Started

The instructions for setting up and switching on your system are included in Section 1. The software can be automatically loaded and started up when the computer is switched on or reset. If your system is not set up to do this, type the commands after the DOS prompt:

```
cd \hvlab                          \ change to HVLab directory

hvlab    (or HVLAB)                \ run the HVLab software
```

After a few seconds, the *HVLab* title screen will be displayed and the "ok" prompt will appear on the left of the screen. The system is now ready for use.

2.2 The Data analysis Words

Each of the commands in the package is defined as a **word** in the computer language **FORTH**. These words perform operations such as data acquisition, arithmetic and time-series analysis functions, frequency-weighting, graphical display, etc. A full description of each word and its method of use is included in Appendix 1. (It is not necessary to have FORTH programming experience to use the *HVLab* software, although a knowledge of the language will allow the user to define new words for specific applications and to compile existing words into programs for batch processing.)

2.3 Some Simple Examples

This exercise illustrates the use of some of the data analysis words in the system. For example, type:

```
1 SINE
```

and press the RETURN key. (Note that **UPPER CASE** characters are used.) If you make a mistake, characters may be deleted using the "backspace" or "backward delete" key. The command you have entered will cause a sinusoidal function to be generated and stored in digital form in a **data file** called "1". You will see some descriptive information relating to this sine function (frequency, sampling rate, etc.) displayed

on the screen, followed by the "ok" prompt. The "ok" tells you that the procedure is complete, and the system is waiting for further instructions.

The data you have generated may be displayed in graphical form. Type:

```
1 GRAPH
```

When the RETURN key is pressed, the contents of data file 1 will be plotted on the screen as a function of time. The **menu** at the bottom of the screen shows the available options for changing the scale, range or size of the display, adding titles to the graph, etc. To exit from graphical display mode, move the cursor to "Exit" using the left or right arrow key and press the RETURN key.

To perform a spectral analysis on this data, type:

```
1 2 PSD
```

This calculates the power spectral density of the time history data in file 1 and puts the result in file 2. As before, the new data may be displayed as a graph:

```
2 GRAPH
```

Because the input was a sine wave, this graph will show a single peak, indicating that the signal contained energy at only one frequency.

2.4 Data Files

Vibration information is stored in the computer in **data files**. The name of a data file must be a positive integer between 1 and 32767. It is necessary to specify file names before using many of the words in the analysis software package.

Routines which operate on existing data require **input files** to be specified. For example:

```
1 GRAPH
```

Routines which generate or alter data require **output files** to be specified:

```
50 SINE
```

Many routines require both input and output files:

```
100 200 PSD
```

A list of the data files you have created may be displayed by typing the word DIR. Files may be deleted using DEL. For example, to delete file 4, type:

```
4 DEL
```

2.5 Parameters

Most of the routines require items of information to be provided by the user each time they are used. Some parameters, such as input and output file names must be typed in from the keyboard before the word is entered. These are known as **stack parameters**. Other parameters are stored in a **parameter table** and are automatically read by the computer when required. The parameter table may be displayed on the

screen by typing:

PARAMETERS

The parameters in the table are listed on the screen, together with their **default values**, i.e. the values to which they are automatically set when the computer is switched on. The use of these parameters is documented fully in Section 3.4, Section 4.5 and Appendix 1 (Directory of the Data Analysis Words).

The menu at the bottom of the screen allows you to make changes to the values of the table parameters as required by the application. The amended table may then be saved to disk, if desired, and previously saved parameter tables may be restored for use. This means that you do not have to set up all the parameter values each time the system is used.

2.6 Calling HELP Messages

Information on the function of the available words and their associated parameters is contained in **HELP windows**. The HELP index may be displayed on the screen by typing:

HELP

The index contains a list of all available data analysis words and other items of information available in HELP. The "Home", "End" and vertical cursor keys allow this list to be scrolled up and down. To get information on any of the subjects listed in the index, press the F2 key and type in the name of the required information (e.g. ARCHIVE). If the name of the word is known, it is not necessary to use the HELP index. Just type, for example:

Use the cursor keys to scroll through a HELP text that is too long to fit in one window. To exit from HELP, use the function key F1. Further information on the facilities available from HELP may be obtained by typing:

HELP HELP

guide.man
August 1994

APPENDIX 1 *HVLab* DATA ANALYSIS WORDS

The words which execute the principal routines for data acquisition and analysis are described on the following pages. The description of each word (which is also available using HELP) includes a list of the required parameters. Some of these must be placed on the stack (i.e. typed in before the word itself); others are set up in the parameter table. The current values of the parameters in the table may be displayed and altered if desired using the word **PARAMETERS**.

To run any of the routines from the keyboard, simply type in the stack parameters in the specified order, separated by spaces, followed by the name of the routine (i.e. the **word**). Examples are given for each word described in this appendix.

HVLab DATA ANALYSIS WORDS

The data acquisition and analysis words in the *HVLab* software package may be placed in the following categories:

1. Utility words - extension utl
2. Display words - extension dis
3. Signal processing and analysis words - extension spa
4. Vibration evaluation words - extension vib
5. Analogue data input and output words - extension adc
6. Signal generation words - extension sig
7. File arithmetic words - extension ari
8. Primitive words - extension prm
9. Programming and system information - extension sys

A collection of **primitive** words exists, with which the more advanced user may write special application routines. These are listed in Appendix 2.

High-level Words Available

Utility Words

ABORT	Aborts a procedure
ALTER	Alters a value in a real file
ARCHIVE	Copies a data file to floppy disk
BYE	Exits to MS-DOS
CBALTER	Alters a value in the control block
CBVALUE	Reads a value from a file control block
CD	Changes the input and output datapaths
CLIMIT	Truncates modulus of a complex file
CMPLX>REAL	Converts a complex file to two real files
COPY	Copies a data file
DEL	Deletes a data file
?DEL	Deletes data files interactively
DIR	Displays directory listing of data files
EXPORT	Converts *HVLab* data to other formats
EXTRACT	Copies part of a data file
HELP	Displays HELP windows

IMPORT	Converts alien data to *HVLab* format
LIMIT	Truncates a real file to specified limits
LXTRACT	Copies part of a data file, unlimited length
MERGE	Merges a number of data files
NDEL	Deletes a series of data files
PARA	Reads or sets a parameter value
PARAMETERS	Displays the parameter table
REAL>CMPLX	Converts two real files to one complex file
REN	Renames a data file
RESAMPLE	Resamples a data file
RESTORE	Copies a data file from floppy disk
SKIP	Copies equally spaced data between files
SORT	Sorts into ascending order
UNITS	Changes units in a data file control block
VALUE	Reads a data value from a data file

Display words

GRAPH	Displays a data file in graph form
GRAPHS	Overlays graphs from different files
LISTING	Lists and edits values in a data file

Signal processing and analysis words

ACF	Auto correlation function
CCF	Cross correlation function
COHERENCY	Coherency function
CONVOLVE	Convolution of two data files
CSD	Computes cross spectral density function
DBRATIO	Ratio of two data files in dB
DIFFERENTIAL	Numerical differentiation of a data file
FFT	Performs Fast Fourier Transform
FILPERCENT	Computes percentiles across files
HIBESSEL	High-pass Bessel filtering
HIBUTTER	High-pass Butterworth filtering
IFT	Computes inverse Fourier Transform
IMPULSE	Generates impulse response function
INCLINATION	Computes rotational angle from horiz accel
INTEGRAL	Numerical integration of a data file

2INTEGRAL	Two-section integration of a data file
INTEGRATE	Cumulative integration of a data file
LOBESSEL	Low-pass Bessel filtering
LOBUTTER	Low-pass Butterworth filtering
MODPHASE	Converts complex data to modulus and phase
NORMALISE	Subtracts mean value from a data file
PERCENTILE	Computes percentile points
PROBDEN	Computes probability density
PSD	Computes power spectral density function
RMS>DC	RMS to DC conversion
ROTATION	Converts two linear motions to rotational
STATISTICS	Computes statistics of a data file
STATS	Computes summary statistics of a data file
TAPER	Applies a cosine taper to ends of a file
TRIGFUNC	Computes trignometric functions on real files
WINDOW	Selects window for spectral analysis
1/1OCTAVE	Computes 1/1 octave spectrum
1/3OCTAVE	Computes 1/3 octave spectrum
1/1FILTER	Applies 1/1 filter to a file
1/3FILTER	Applies 1/3 filter to a file

Vibration evaluation words

ADRIDE	Continuous ride evaluation
FWEIGHT	Frequency weights acceleration psd
MSDV	Computes motion sickness dose value
MSI	Computes motion sickness index
RIDE	Vehicle ride evaluation
RMS	Computes root-mean-square of a data file
VDV	Computes vibration dose value
WEIGHT	Performs BSI and ISO frequency weighting
WEIGHTING	Generates frequency weighting curves

Analogue data input and output words

ADC	Non-interactive AtoD conversion
ADRIDE	Continuous ride evaluation
CALIBRATE	Calibration and ranging of input channels
DATA	Input and/or output of analogue data

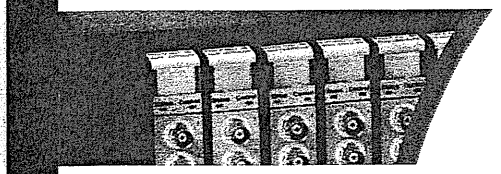
STREAM	Stream data via disk

Signal generation words

RANDOM	Generates random function
SINE	Generates sinusoidal function
SWEEP	Generates sine sweep function

File arithmetic words

CMPLXFN	Complex functions on values in data file
FILE+	Adds a constant to a data file
FILE-	Subtracts a constant from a data file
FILE*	Multiplies a data file by a constant
FILE/	Divides a data file by a constant
FILE+FILE	Addition of two data files
FILE-FILE	Subtraction of two data files
FILE*FILE	Multiplication of two data files
FILE/FILE	Division of two data files
FILAVERAGE	Computes averages across several files
FILESQ	Squares a data file
FILESQRT	Square root of a data file
FILOG	Log_{10} of a data file
-FILE	Subtracts file from a constant
/FILE	Divides constant by a file
REALFN	Real functions on values in data file
RUNAVERAGE	Computes running averages through data file

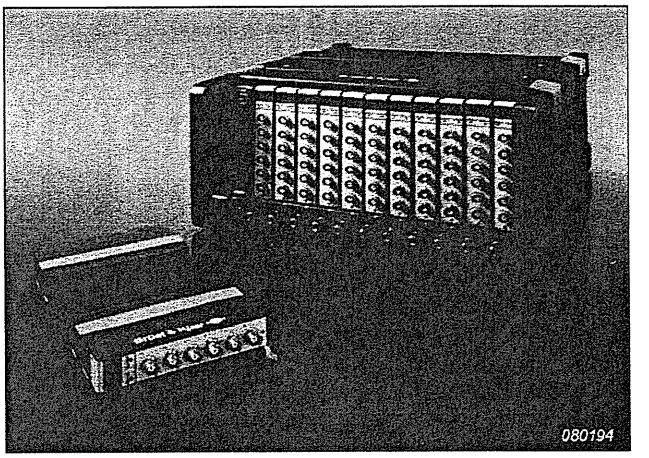


PRODUCT DATA

PULSE™、Test for I-deas™ 用 LAN-XI データ収集ハードウェア

2ch から 1000ch 以上をひとつのシステムで
LAN-XI データ収集ハードウェアはモジュール式の多機能なシステムで、シングルモジュール、分散モジュール、11 モジュールフレームで使用することができます。ハードウェアは IDA^{e} ハードウェアと完全な互換性を持ち、PULSE、Test for I-deas の両方で動作します。

モジュールは非常に堅牢な工業デザインで、フィールドでの使用に最適です。またプラグ・アンド・プレイが可能なため容易に構成を変更することができます。LAN-XI は電源として AC、DC または Power over Ethernet (PoE) を使用可能で、フロントパネルは交換可能であるため、非常にフレキシブルなシステムを提供します。2 チャンネルから 1000 チャンネル以上を周波数範囲 51.2 kHz で制限無くデータ転送を行います。



用途および特徴

用途
- 多チャンネルの音響・振動信号のリアルタイム収集。2ch から 1000ch 以上に自在に構築可能。すべての位相およびサンプリングの同期 (IEEE 1588 Precision Time Protocol)：
  - ひとつのモジュールのスタンドアロン使用、最大 6ch 入力、2ch 出力
  - 分散マルチチャンネルシステム。ひとつひとつのモジュールを測定場所の近くに配置
  - 複数のモジュールを組み合わせて、マルチチャンネルシステムの構築
- ラボおよびフィールドの両方に対応する電源システム (AC、DC、バッテリ、PoE)

特徴
- 同一の入力チャンネルであらゆる音響、振動トランスデューサのコンディショニング
- 標準周波数範囲 0 - 51.2 kHz
- 信号発振器出力 0 - 51.2 kHz
- Dyn-X テクノロジーにより、160 dB の入力レンジ
- 交換可能なフロントパネル (BNC または LEMO) により、用途に応じたトランスデューサケーブルを使用可能
- 個々のモジュールのフロントパネルにディスプレイ：
  - システムの構築を単純化し、セットアップ時間を短縮
  - モジュールの状態、セルフテストおよびエラー内容を表示
- 帯域外信号のオーバーロードおよ発振器のオーバーロードを含む完全なオーバーロード検知機能
- チャンネルごとに不正／不良なコンディショニングを指示
- LAN 接続により測定対象物に近接してフロントエンドを配置可能。信号線、トランスデューサのケーブル長を短くできる
- 電源：AC 電源、DC、バッテリ、スタンドアロンの場合は PoE (IEEE 802.3af)
- 堅牢かつ軽量な鋳造マグネシウム筐体
- 静音動作
- PULSE IDA^{e} ハードウェアと完全互換
- すべての PULSE アプリケーションで完全互換
  - ハードウェアとトランスデューサの自動検出
  - IEEE 1451.4 TEDS トランスデューサのサポート

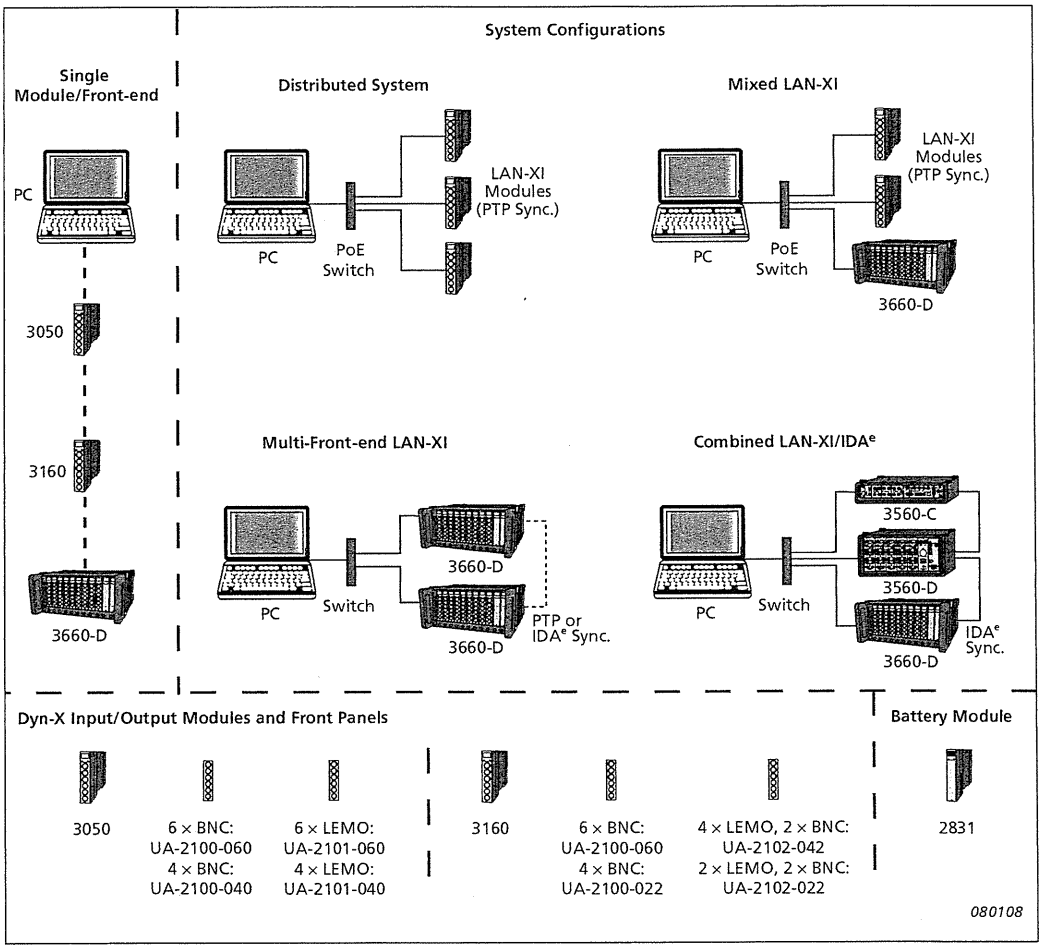
Brüel & Kjær

システムの概要

3660 型 LAN-XI データ収集ハードウェアは、スタンドアロン、分散システム、11 モジュールを内蔵するフレームのいずれの形態でも使用可能な入力 / 出力モジュールです。PULSE IDA^{e} ハードウェアと完全な互換性を持つ LAN-XI ハードウェアは非常にフレキシブルで、測定要求に応じて 2ch から 1000ch 以上のシステムを容易に構築可能です。

図 1 は可能なシステム構成の概要を、表 1 はモジュールの型番別の詳細を示します。フレーム、モジュール、入出力チャンネルについての詳細な情報は、この後に記載されている製品仕様をご参照ください。

図 1
LAN-XI システムで使用可能なコンポーネントおよび IDA^{e} ハードウェアとの組み合わせ



どのモジュールもスタンドアロン、分散システム、フレームに内蔵された状態のいずれでも使用することができるため、測定対象物の近くにフロントエンドを設置することができます。Precision Time Protocol (PTP) はシステム内のコンポーネントのクロックをサブマイクロ秒の精度で同期することが可能です。PoE を使用するためには PC とモジュール間を標準の CAT6 LAN ケーブルと PoE スイッチで接続するだけです。これにより必要なケーブルの量を最小化することができ、低コスト、ダウンタイムの短縮、メンテナンスの単純化、フレキシビリティの最大化、インストレーションの高速化が可能です（図 2 と 図 3 を比較してください）。