STAGE ACCOMPANY network

SAnet

- SAnet equipped devices.

1 - Active loudspeaker system,
SA 4525 (Blue Box).

2 - Power amplifier:
PPA 1200.

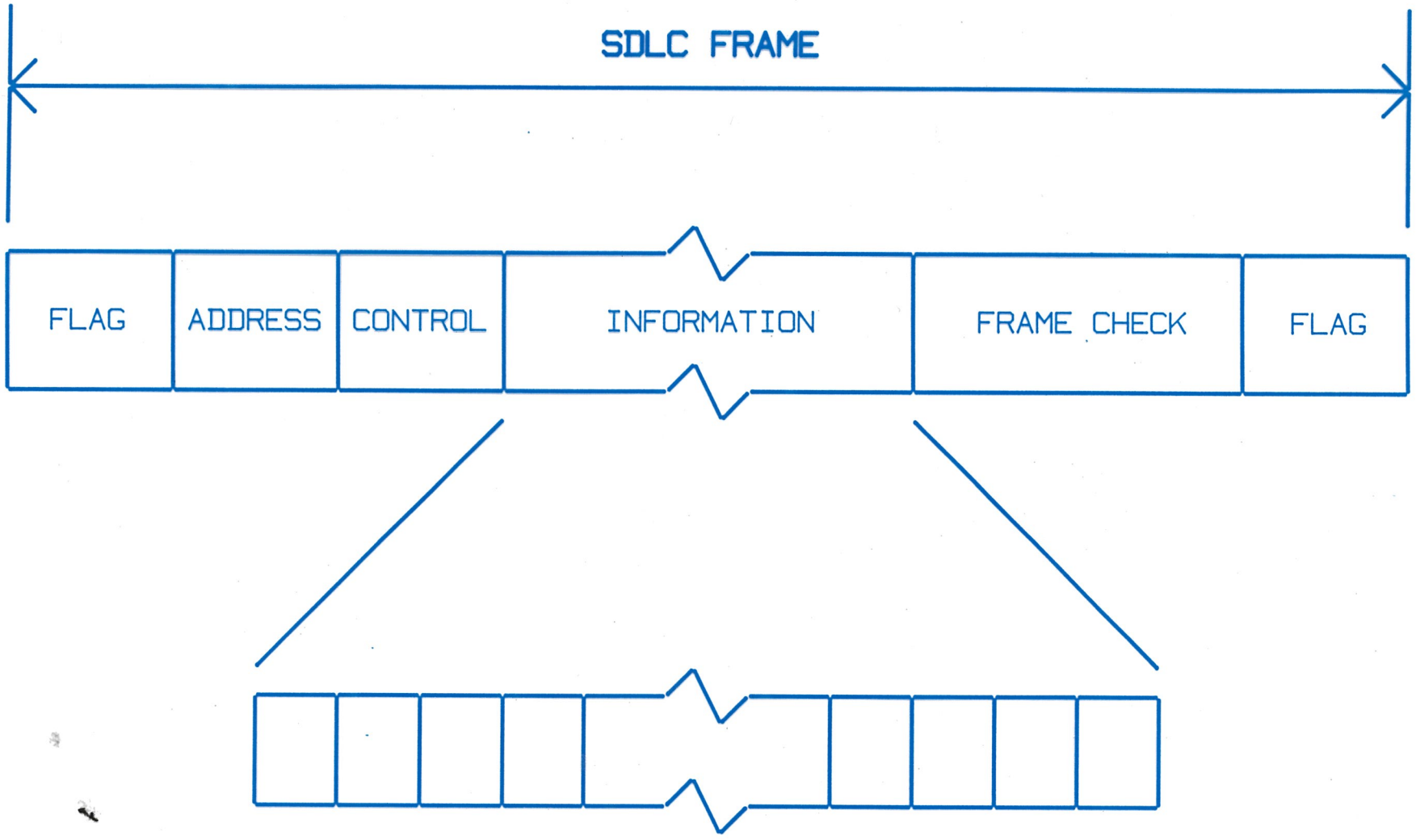
3 - Parametric equaliser:
PPE 2400.

STAGE ACCOMPANY network

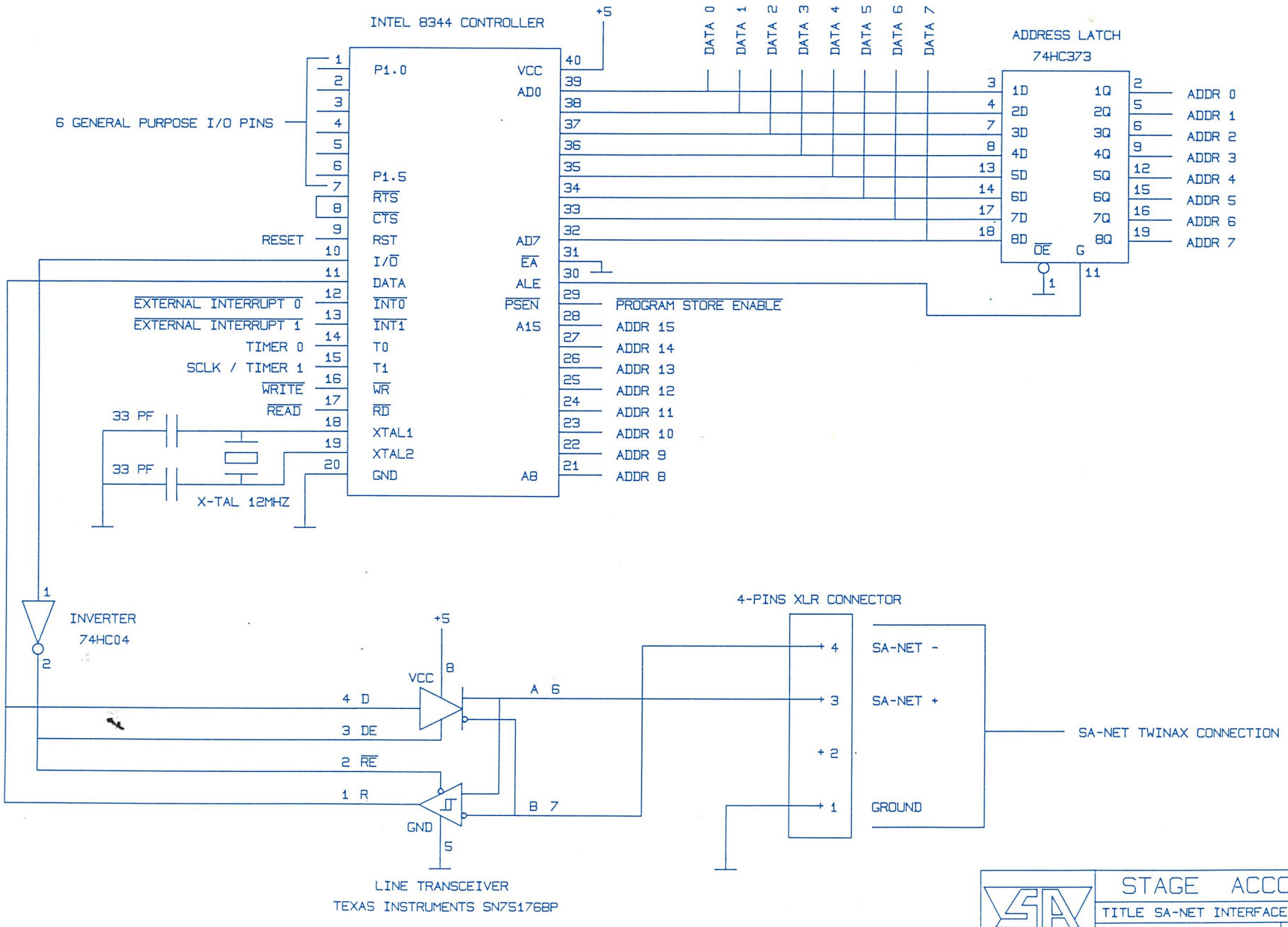
SAnet

- Future of SAnet

1 - Universal application.
2 - Universal use.
3 - Standard?



SA-NET SDLC FRAME



STAGE ACCOMPANY		
TITLE SA-NET INTERFACE HARDWARE		
REVISIONS ---		DRAWN G.R.
A3	DATE 17-02-88	SHEET 1 OF 1

STAGE ACCOMPANY network

SAnet

- Applications

1 - Control.
    - Simplified operation.
    - Presets and soundcheck.
    - Presets and synchronisation.
2 - Monitoring.
    - Routine tasks.
    - Maintenance of equipment.
3 - Software downloading.
    - Software updating.
    - Customised software .

SAnet - STAGE ACCOMPANY netwerk

*** - Motivatie
- Realisatie
- Toepassingen

1 - Eerste digitaal bestuurde apparaat: PPE-2400.
2 - Extern oproepen van presets: MIDI.
3 - Totale controle over systeem parameters:
bijv. Blue Box.
4 - MIDI minder geschikt.
5 - Ontwikkeling SAnet:
- Netwerk-achtig karakter.
- Tenminste 100 stations.
- Foutcorrectie.
- Minimale afstand 1000m.

SAnet - STAGE ACCOMPANY netwerk

- Motivatie
- *** Realisatie
- Toepassingen

1 - Multipoint netwerk.
- Controller of primary (poll commands).
- Stations of secondaries.

2 - Controller (primary).
- EEPROM programma geheugen.
- Dual Port RAM interface met de PC.
- Galvanische scheiding PC - SAnet.
- Linedriver.

3 - Station (secondary).
- Mastermode ("multi tracking").
- Willekeurig apparaat (geluid, licht, servo/motor).

4 - Protocol (SDLC).
- Serieele transmissie (375 kbits/sec.).
- Synchrone transmissie (frames).

5 - Verbindingsmateriaal.
- 4-polige XLR connectoren met twinax kabel.

SAnet - STAGE ACCOMPANY netwerk

- Motivatie
- Realisatie

*** - Toepassingen

1 - Besturing.
- Eenvoudiger bediening.
- Presets en insteltijd.
- Presets en synchronisatie.

2 - Bewaking.
- Routinematige handelingen.
- Onderhoud.

3 - Software "downloading".
- Updates.
- Software op maat.

4 - Toekomst.
- Universeel gebruik.
- Standaard?

SAnet - STAGE ACCOMPANY netwerk

*** - Realisatie

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1 - SAnet: een multipoint netwerk. ***** SCHERM 1 *****

- 1 Controller of primary beheert het SAnet (poll commando's).
- Maximaal 250 stations of secondaries.

2 - Controller (primary). ***** SCHERM 2 *****

- primary is opgebouwd rond een speciaal Intel component: de 8344 Serial Interface Controller
- het programma geheugen bestaat uit EEPROM, een geheugen dat elektrisch gewist en weer geprogrammeerd kan worden. Voordeel: eenvoudige software updates
- Dual Port RAM zorgt voor communicatie met de PC. Commando's naar primary, SAnet data naar PC.
- Galvanische scheiding PC - SAnet. De geringste storing vanuit SAnet kan platgaan van PC betekenen
- Line driver is kortsluitvast en beveiligd tegen hoge common mode spanningen van buitenaf. (extreme omstandigheden)

3 - Station (secondary).

- Secondary maakt gebruik van dezelfde Intel controller als de primary. Instelling als primary of secondary is kwestie van software
- Als er geen PC beschikbaar is: Master mode ("multi tracking").
- Willekeurig apparaat (geluid, licht, servo/motor). Er wordt maar 1 eis gesteld: SAnet interface

4 - Een protocol bevat afspraken over zaken als systeembeheer, dataformaat, foutdetektie en foutkorrektie.

- Datatransport over serieele lijn met een snelheid van 375 kbits/sec.
- data wordt synchroon verzonden (frames). ***** SHEET *****
  frame behandelen, overgaand in:
- Foutkorrektie.

5 - Verbindingsmateriaal.

- Als SAnet verbinding hebben we gekozen voor 4-Polige XLR connectoren met twinax kabel. XLR - connectoren algemeen bekend in geluidswereld. twinax kabel kan onder minder extreme omstandigheden vervangen worden door microfoon snoer.

SAnet - STAGE ACCOMPANY netwerk

*** - Toepassingen

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1 - Besturing.
- De bediening wordt eenvoudiger door gebruik van grafische mogelijkheden van de PC
  Denk bijvoorbeeld aan de instelling van de PPE-2400:
  curve editten i.p.v. getallen wijzigen
- Presets en insteltijd.
  Indien alle parameters van TOTALE systeem bekend bij PC:
  drastische verkorting van de insteltijd
  presets kunnen worden opgeslagen en teruggeroepen van disk
- Presets en synchronisatie.
  SAnet als synchronisatie interface is mogelijk
  Er wordt gewerkt aan koppelingen tussen MIDI, SMPTE en SAnet

2 - Bewaking.
- Totaaloverzicht maakt snel ingrijpen mogelijk
- Routinematige handelingen, zoals level-, vermogens-, of temperatuurbewakingen kunnen door PC overgenomen worden
  Mogelijkheid om PC automatisch te laten ingrijpen
- Onderhoud van apparatuur via PC
  SA apparatuur bevat soort 'logboek' met gegevens als bedrijfsuren, opgetreden storingen, etc.
  PC geeft aan wanneer onderhoud noodzakelijk is
  groot voordeel voor verhuurbedrijven

3 - Software "downloading".
- Zoals de primary, kan de secondary voorzien worden van EEPROM
  Software updates zijn dan zeer eenvoudig
  Voorbeeld: 25 Blue Boxen worden in 5 minuten ge-updated.
- Software op maat maken d.m.v. downloaden specifieke systeem constanten naar universele software

4 - SAnet toekomst volgens Stage Accompany
- SA hoopt op universeel gebruik
  net als bij MIDI hoeft een apparaat slechts te worden voorzien van een simpele interface
- Aangezien er nog geen vergelijkbaar netwerk bestaat, hoopt Stage Accompany met de ontwikkeling van SAnet een belangrijke bijdrage te hebben geleverd aan het tot stand komen van een algemeen geaccepteerde standaard.

Text sheet 0:

Good morning, (ladies and) gentlemen,

My name is Gert Rosenboom and I work with Stage Accompany where I join a young team that developes digital controlled equipment.

I want to tell you something about our new network, that is called SAnet.

First I'll try to give you some reasons why we have developed just another network.

After that I'll tell you something about the hardware requirements of an SAnet interface and about our PC-based network controller.

Finally, I'll show you some application examples.

If you have any questions, you can contact me after this lecture or at the Stage Accompany stand, number D five hundred nine.

Text sheet 1 - Motivation:

In 1985 we developed our first digital controlled device; the parametric equaliser PPE-2400. All parameters of this equaliser are controlled by a microprocessor.

One of the advantages of using a microprocessor is the fact that combinations of parameters can be stored in memory. These presets can be recalled at any time.

After the introduction of the equaliser, many users wanted to recall the presets remotely. So the equaliser was provided with a Midi interface.

During the development of new devices like the Blue Box, however, we feld the need to control the complete set of parameters remotely.
Besides, we wanted to monitor a complete system from a central point.

The Midi interface has a mode called "exclusive messages mode" that could be used for our purposes.

But Midi has disadvantages. It is a typical point-to-point interface.
If we want to control, say, fifty Blue Boxes, we need fifty connections between the central operating point and the Blue Boxes.

We can not use the Midi "channel" facility because we want to control as well as monitor, the Blue Boxes separately.

Besides, with Midi it is not easy to implement a protocol that provides for error correction.

Furthermore, maximum allowable cable distances are too short.

It will be clear that Midi was less suitable for our purposes.
So we decided to look for an alternative.

First we listed the four most important interface requirements.

Text sheet 2 - Interface requirements:

The interface requirements were as follows:

It needs to have a multipoint network structure to allow for efficient connections.

Besides, the number of separately controllable devices needs to be at least one hundred to control, for example, a system of one hundred Blue Boxes.

Furthermore, the data transfer has to be transparant and error free.

And finally, the allowable cable length has to be more than one thousand meters.

Text sheet 3 - Development of SAnet:

*** "Development of SAnet" dia *** (1)

After evaluation of existing multipoint networks like Ethernet or Starlan, which suffer from high complexity and cost, we decided to develop a simple and professional network with a special component from Intel; the 8344 serial interface controller.

Using this component we have developed a multipoint network, called SAnet. It consists of one network controller or primary station and up to two hundred and fifty secondary stations.

All communications on SAnet are from the primary station to one or more secondary stations, and from a secondary station to the primary station.

Like most interfaces, the data transfer on SAnet is serial.
The transmission speed is three hundred and seventy five kilobits per second.

*** "SDLC frame" dia *** (2)

All transmissions on SAnet are organised in a specific format called a frame.
Each frame has the same specific format.
As you can see, it is made up of several fields that each have a special network function.
The frame is enclosed by flags. A flag is a unique combination of bits.
They serve to indicate the begin and end of a frame.

The second field in the frame is the station address. The station address indentifies the secondary station the frame is going to or coming from. It's like an address or a return address on a letter.

The third field in the frame is the control field. It defines the function of the frame.

Following the control field, there may be an information field of up to sixty-four bytes.

Following the information field is the frame check sequence field.
The purpose of the frame check sequence is to check the received frame for errors that may have been introduced by the communication channel.
This field contains a sixteen-bit check sequence that is the result of a computation on the contents of the address, control, and information fields at the transmitter.
The receiver performs a similar computation and checks its results.
The receiver accepts no frame that is found to be in error.
The transmitter will retransmit the frame until it has been acknowledged.

All these matters like system control, data format, and error correction are fixed in a protocol. The protocol used with SAnet was derived from IBM's standard SDLC protocol.

A subset of this protocol has been implemented in hardware by Intel, resulting in the 8344 serial interface controller.

Text sheet 4 - Hardware implementation:

*** "Hardware implementation" dia *** (3)

The primary station as well as the secondary stations in SAnet use the same basic hardware build around just two components; the 8344 interface controller and an inexpensive line driver.

An advantage of this controller is the fact that it contains an industry standard 8051 controller and a serial interface unit.

The used line driver is protected against short circuit and high common mode voltages from outside.

The various devices of SAnet are connected to each other by means of a two-wire coax cable, according to RS422.

We chose four-pins XLR connectors to interconnect the devices with the twinax cable. Since XLR connectors are widely used in the pro audio industry, the availability and use of four-pins XLR connectors will not cause serious problems.

*** "SAnet interface hardware schematic" dia *** (4)

(aanwijzen)
As I said, there are just two components needed. The 8344 interface controller and a line driver.

The standard controller can be used for any application, while the serial interface controller handles SAnet interfacing.

The serial interface controller can be configured as a primary station or a secondary station. All you have to do is select the proper mode and the right software. For this reason the controller can work in flexible or auto mode, respectively to be a primary or secondary station.

An example of an SAnet controller implementation is the IBM PC-compatible controller that we have developed.

Text sheet 5 - SAnet controller SC-250A:

The SAnet controller uses the basic SAnet interface hardware consisting of the 8344 controller and the line driver.

The 8051 part of the controller serves as an input/output controller for the PC. So the PC can be relieved from controlling SAnet.

The serial interface controller of the 8344 operates in flexible mode. On request, it creates and maintains communication links with the secondary stations.

The controller has been provided with updateable program memory to allow for fast and easy software updates.
Another advantage is the easy installation of custom made software.

At the moment the controller contains a basic software package that can be extended in the future. In this way, more and more intelligence can be integrated into the SAnet controller.

An important feature of the controller is the galvanic separation of the PC and SAnet.
Everyone knows that little interference can cause malfunction of the PC. Therefore, both the circuits have been separated by means of opto couplers.

*** "SAnet controller" dia *** (5)

(aanwijzen)
This is the SAnet controller...
Here we have the interface controller. This is the updateable memory. These are the opto couplers. And this is the line driver. Furthermore there is some glue logic.

This is SAnet connecting some secondary stations to the controller.

Text sheet 06 - SAnet equipped devices:

At the moment, we have three devices equipped with an SAnet interface.

The first one is the Blue Box, a loudspeaker system with a build-in amplifier module and microprocessor control.
These Blue Boxes can be combined to form a complete PA. A PC serves as central operating point in these extended systems.
The Blue Box software will be demonstrated on the Stage Accompany stand.

The next one is a power amplifier, the PPA-1200. This amplifier has been provided with updateable program memory, so it can be updated by the PC via SAnet. User constants like power limit parameters, maximum temperatures, level settings, etc. can be downloaded as well.
Like Blue Box control, the PC can serve as a central operating point in extended systems.

The parametric equaliser PPE-2400 has recently been upgraded with an SAnet interface. It has updateable program memory too.
We are working on a software package to control it with a PC.

Using a PC you can take full advantage of the graphic capabilities of the PC's screen. In stead of supplying the equaliser with a number of system parameters like gain, Q-factor and center frequencies, it is possible to edit, for example, the frequency characteristic of the equaliser.

Text sheet #7 - Future of SAnet:

SAnet is a universal network with numerous applications. I already mentioned some in connection with our SAnet equipped devices.

Besides using a PC as a network master, you can configure any device as a master simply be using the appropriate software. A point-to-point interface can be realised very easily by making one device the master and the other the slave, just by selecting the right software.

Besides using this point-to-point connection as a communication interface it can be used as a synchronisation interface as well.

It should be clear that SAnet is not restricted to audio applications only. SAnet can be used for video, light, motor and servo applications as well. Think, for example, of a complete system consisting of sound, light and servo equipment that is synchronised to a master like a Compact Disc player.

But what about the future of SAnet?

We would appreciate it, if other manufacturers integrate an SAnet interface into their own equipment. For these purposes, information from Stage Accompany will be available soon.

And why should you invent the wheel twice?
SAnet is a perfect alternative for Midi in network-like environments.

Just like Midi, the only requirement for an SAnet interface is that the device can be controlled by a simple microprocessor.

Since there is no comparable network for our kind of applications yet, with the development of SAnet, we hope to have contributed to the establishment of a general accepted standard.

Once again I would like to say that if you have any questions, you can contact me after this lecture or at the Stage Accompany stand, number D five hundred nine.

I'll be pleased to give you more information.

Thank you. for your attention.