SI/EPG For Digital Broadcasting Receiver

AGENDA

- Overview of SI
- ARIB SI
- Studio Systems
- Receiver Systems
- BS Digital Broadcasting Services
SI/EPG  For Digital Broadcasting Receiver

Overview of SI

SI : Service Information
EPG : Electronic Program Guide
PSI : Program Specific Information
Overview of SI

Video/Audio Channel 1
Video/Audio Channel 2

:  
Video/Audio Channel N

Data Broadcast

Packetized and Multiplexed together

Transport Packet

Channel 1
Channel N

PSI/SI

PROGRAM MULTIPLEXING

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Overview of SI

Program Selection in EPG

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SI/EPG For Digital Broadcasting Receiver

SI Standard

ARIB

- ARIB STD-B10
- ARIB TR-B15

DTV

- Specification for Service Information in Digital Video Broadcasting systems

ATSC

- ATSC Standard A65
  Program and System Information Protocol For Terrestrial Broadcast And Cable (PSIP)

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SI/EPG For Digital Broadcasting Receiver

ARIB SI

• ARIB STD-B10
  [Service Information For Digital Broadcasting System]
  September 1997     Ver. 1.0
  July           1998     Ver. 1.1
  May            1999     Ver. 1.2

• ARIB TR-B15 Part2 Section4
  [PSI/SI Operational Guideline]

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SI/EPG For Digital Broadcasting Receiver

ARIB SI

Defined in MPEG2
- PAT
- CAT
- PMT

Defined in ARIB
- NIT Self
- NIT Other
- SDT Self
- SDT Other
- SDT Self Schedule
- SDT Other Schedule

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### SI/EPG For Digital Broadcasting Receiver

#### Program Schedule

<table>
<thead>
<tr>
<th>Source ID</th>
<th>Source Name</th>
<th>Program Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>x0053</td>
<td>ESPN1</td>
<td>6:00PM: Fools &amp; Blockers, Score Updates, Boxing</td>
</tr>
<tr>
<td>x0072</td>
<td>NBC</td>
<td>6:00PM: Seinfeld, Friends, 7:00PM: Local News</td>
</tr>
<tr>
<td>x0426</td>
<td>CNN</td>
<td>6:00PM: Financial News, World Report, Travel: Sights &amp; Sounds</td>
</tr>
<tr>
<td>x0089</td>
<td>ABC</td>
<td>6:00PM: Football, Friends, Simpsons, The Critics</td>
</tr>
<tr>
<td>x1537</td>
<td>ESPN2</td>
<td>6:00PM: PGA Tournament, Spotlight: Michael Jordan</td>
</tr>
<tr>
<td>x0440</td>
<td>FOX</td>
<td>6:00PM: Married With Children, Friends, Simpsons, The Critics</td>
</tr>
<tr>
<td>x0041</td>
<td>CBS</td>
<td>6:00PM: Local News, World News, Movies Special</td>
</tr>
<tr>
<td>x0955</td>
<td>HBO</td>
<td>6:00PM: Mr. Beans, UFO Sightings</td>
</tr>
</tbody>
</table>

#### Stream Parameters

<table>
<thead>
<tr>
<th>Program No</th>
<th>Source ID</th>
<th>Frequency</th>
<th>Channel Type</th>
<th>Video Standard</th>
<th>Scrambled</th>
</tr>
</thead>
<tbody>
<tr>
<td>x0032</td>
<td>x0426</td>
<td>56.0 MHz</td>
<td>Normal</td>
<td>MPEG2</td>
<td>No</td>
</tr>
<tr>
<td>x0045</td>
<td>x0089</td>
<td>63.0 MHz</td>
<td>Normal</td>
<td>MPEG2</td>
<td>No</td>
</tr>
<tr>
<td>x0027</td>
<td>x1537</td>
<td>72.0 MHz</td>
<td>Analog</td>
<td>NTSC</td>
<td>No</td>
</tr>
<tr>
<td>x0021</td>
<td>x0072</td>
<td>88.0 MHz</td>
<td>Normal</td>
<td>MPEG2</td>
<td>No</td>
</tr>
<tr>
<td>x0078</td>
<td>x053</td>
<td>101.0 MHz</td>
<td>Analog</td>
<td>NTSC</td>
<td>No</td>
</tr>
<tr>
<td>x0062</td>
<td>x055</td>
<td>104.0 MHz</td>
<td>Normal</td>
<td>MPEG2</td>
<td>No</td>
</tr>
<tr>
<td>x0014</td>
<td>x0440</td>
<td>168.0 MHz</td>
<td>Normal</td>
<td>MPEG2</td>
<td>No</td>
</tr>
<tr>
<td>x0007</td>
<td>x0041</td>
<td>497.0 MHz</td>
<td>Normal</td>
<td>MPEG2</td>
<td>No</td>
</tr>
</tbody>
</table>

#### Audio Parameters

<table>
<thead>
<tr>
<th>Program No</th>
<th>Source ID</th>
<th>Frequency</th>
<th>Channel Type</th>
<th>Audio PID(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>x0070</td>
<td>x0007</td>
<td>56.0 MHz</td>
<td>Normal</td>
<td>x0071</td>
</tr>
<tr>
<td>x0015</td>
<td>x0150</td>
<td>63.0 MHz</td>
<td>Normal</td>
<td>x0074</td>
</tr>
<tr>
<td>x0021</td>
<td>x0210</td>
<td>72.0 MHz</td>
<td>Analog</td>
<td>x0075</td>
</tr>
<tr>
<td>x0027</td>
<td>x0270</td>
<td>88.0 MHz</td>
<td>Normal</td>
<td>x0076</td>
</tr>
<tr>
<td>x0032</td>
<td>x0320</td>
<td>101.0 MHz</td>
<td>Analog</td>
<td></td>
</tr>
<tr>
<td>x0045</td>
<td>x0450</td>
<td>104.0 MHz</td>
<td>Normal</td>
<td></td>
</tr>
<tr>
<td>x0062</td>
<td>x0620</td>
<td>168.0 MHz</td>
<td>Normal</td>
<td></td>
</tr>
<tr>
<td>x0078</td>
<td>x0780</td>
<td>497.0 MHz</td>
<td>Normal</td>
<td></td>
</tr>
</tbody>
</table>

#### PID Parameters

<table>
<thead>
<tr>
<th>PID</th>
<th>Program No</th>
<th>Stream Type</th>
<th>Video_PID</th>
<th>Audio_PID(s)</th>
<th>Private/Data_PID(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>x0070</td>
<td>x0007</td>
<td>MPEG2</td>
<td>x0071</td>
<td>x0074</td>
<td>x007A</td>
</tr>
</tbody>
</table>

**User Selected Program to Watch**

**Data Parser**

**Audio Decoder**

**Video Decoder**

**PID = x0074**

**PID = x0075**

**PID = x0076**

**Private Data**
## SI/EPG For Digital Broadcasting Receiver

### ARIB SI

<table>
<thead>
<tr>
<th>Table_id</th>
<th>Table</th>
<th>Transmit Level</th>
<th>Transmit Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>0x00</td>
<td>PAT</td>
<td>Necessary</td>
<td>At least 1 time/10 ms</td>
</tr>
<tr>
<td>0x01</td>
<td>CAT</td>
<td>Necessary</td>
<td>At least 1 time/1 s</td>
</tr>
<tr>
<td>0x02</td>
<td>PMT</td>
<td>Necessary</td>
<td>At least 1 time/100 ms</td>
</tr>
<tr>
<td>0x40</td>
<td>NIT(Self)</td>
<td>Necessary</td>
<td>At least 1 time/10 s</td>
</tr>
<tr>
<td>0x41</td>
<td>NIT(Other)</td>
<td>Optional</td>
<td>At least 1 time/10 s</td>
</tr>
<tr>
<td>0x42</td>
<td>SDT(Self)</td>
<td>Necessary</td>
<td>At least 1 time/2 s</td>
</tr>
<tr>
<td>0x46</td>
<td>SDT(Other)</td>
<td>Optional</td>
<td>At least 1 time/10 s</td>
</tr>
<tr>
<td>0x4A</td>
<td>BAT</td>
<td>Optional</td>
<td>At least 1 time/10 s</td>
</tr>
<tr>
<td>0x4E</td>
<td>EIT(Self Preset/Following)</td>
<td>Necessary</td>
<td>At least 1 time/2 s</td>
</tr>
<tr>
<td>0x4F</td>
<td>EIT(Other Preset/Following)</td>
<td>Optional</td>
<td>At least 1 time/10 s</td>
</tr>
<tr>
<td>0x50 –</td>
<td>EIT(Self Basic)</td>
<td>Optional</td>
<td>At least 1 time/10 s</td>
</tr>
<tr>
<td>0x5F</td>
<td>EIT(Self Extended)</td>
<td>Optional</td>
<td>At least 1 time/30 s</td>
</tr>
<tr>
<td>0x60 –</td>
<td>EIT(Other Basic)</td>
<td>Optional</td>
<td>At least 1 time/10 s</td>
</tr>
<tr>
<td>0x6F</td>
<td>EIT(Other Extended)</td>
<td>Optional</td>
<td>At least 1 time/30 s</td>
</tr>
<tr>
<td>0x70</td>
<td>TDT</td>
<td>Necessary</td>
<td>At least 1 time/30 s</td>
</tr>
<tr>
<td>0x71</td>
<td>RST</td>
<td>Optional</td>
<td>Optional</td>
</tr>
<tr>
<td>0x72</td>
<td>ST</td>
<td>Optional</td>
<td>Optional</td>
</tr>
<tr>
<td>0x73</td>
<td>TOT</td>
<td>Necessary</td>
<td>At least 1 time/30 s</td>
</tr>
<tr>
<td>0xC2</td>
<td>PCAT</td>
<td>Optional</td>
<td>Optional</td>
</tr>
</tbody>
</table>
Descriptors in ARIB SI (STD-B10)

- Conditional Access descriptor
- Network Name descriptor
- Service List descriptor
- Stuffing descriptor
- Satellite delivery descriptor
- Service descriptor
- Short Event descriptor
- Extended Event descriptor
- Component descriptor
- Stream Identifier descriptor
- Content descriptor
- Parental Rate descriptor
- Local Time Offset descriptor
- Hyper Link descriptor
- Hierachial Transmission descriptor
- Digital Copy descriptor
- Audio Component descriptor
- Target Area descriptor
- Data Content descriptor

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Descriptors in ARIB SI (STD-B10) Continued

- Video Decode descriptor
- CA EMM TS descriptor
- CA Contract Info descriptor
- CA Service descriptor
- Emergency Information descriptor
- Data Component descriptor
- Download Content descriptor
- System Management descriptor
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Descriptors in ARIB SI/TR-B15

- SI Parameter descriptor
- Event Group descriptor
- Series descriptor
- Broadcaster Name descriptor
- Component Group descriptor
SI/EPG For Digital Broadcasting Receiver

Full SI and Self SI

**Full SI**
- NIT
- SDT actual
- SDT other
- EIT p/f actual
- EIT p/f other
- EIT sch actual
- EIT sch other

**Self SI**
- EIT p/f actual
- EIT p/f other
- EIT Sch actual Basic
- EIT Sch other Basic
- EIT Sch actual Extend
- EIT Sch other Extend

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SI/EPG  For Digital Broadcasting Receiver

Multi-section Transmission

<table>
<thead>
<tr>
<th>TS Header</th>
<th>Pointer Field</th>
<th>Section A</th>
<th>Stuffing</th>
</tr>
</thead>
</table>

Multi-section Transmission

<table>
<thead>
<tr>
<th>TS Header</th>
<th>Pointer Field</th>
<th>Section Continued</th>
<th>Section A</th>
<th>Section B</th>
<th>Stuffing</th>
</tr>
</thead>
</table>

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SI/EPG For Digital Broadcasting Receiver

Studio Systems For Self SI

Traffic Systems
VCR, VTR
LAN

Encoders
Multiplexer
Demultiplexer

Decode s

SI Editor
SI Server
SI Monitor

SI System

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SI/EPG For Digital Broadcasting Receiver

Studio System For Full SI

SI Center

Common SI Data-Base

SI Editor

Program Schedule

SI

Traffic Systems

Encoders

Multiplexer

SI System

Mitsubishi Digital Broadcasting System

Modulator

Broadcasters A, B, C

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Examples of Studio system Operation (daily update)

Compiling SI DB to Section/ and Sending to Multiplexor schedule

Once a day gets next 8 days Play lists

Traffic System
Data Server
SI Editor
SI Server

100Base-TX/ DVB-ASI

Multiplexor

SI DB

LAN

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Examples of Studio system Operation (Irregular update)

- Get irregular program update information from Data Server by interrupt
- Compile updated SI DB to Section/TS and Sending to Multiplexor by interrupt

**SI/EPG For Digital Broadcasting Receiver**

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SI/EPG For Digital Broadcasting Receiver

Receiver Systems

- Tuner
- 8PSK DMD
- TS Demux
- Audio Decoder
- Video Decoder
- Plane Controller
- Audio
- Video
- I/O
- NVRAM
- Flash
- ROM
- Font etc.
- RAM
- Main Memory
- CPU
- Remote Controller
- Modem

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SI/EPG For Digital Broadcasting Receiver

Receiver Systems

- EPG Viewer
- Data Broadcasting Viewer
- Caption Viewer
- PSI/SI DB
- DSMCC DB
- PES
- TV Controller
- Demux
- A/V Decoder
- Graphic Controller
- Tuner Controller

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### SI/EPG For Digital Broadcasting Receiver

**BS Digital Broadcasting Services**

**HDTV Broadcasters**

<table>
<thead>
<tr>
<th>NHK HiVision</th>
<th>BS Nittere</th>
<th>BS ASAHI</th>
<th>BS-i</th>
</tr>
</thead>
<tbody>
<tr>
<td>BS JAPAN</td>
<td>BS FUJI</td>
<td>WOWOW</td>
<td></td>
</tr>
</tbody>
</table>

**SDTV Broadcasters**

<table>
<thead>
<tr>
<th>NHK BS-1</th>
<th>NHK BS-2</th>
<th>Star Channel</th>
</tr>
</thead>
</table>
### SI/EPG For Digital Broadcasting Receiver

#### Audio Broadcasters (TV Broadcasters)

<table>
<thead>
<tr>
<th>BS Nippon</th>
<th>BS ASAHI</th>
<th>BS-I</th>
</tr>
</thead>
<tbody>
<tr>
<td>BS JAPAN</td>
<td>BS FUJI</td>
<td>WOWOW</td>
</tr>
</tbody>
</table>

#### Audio Broadcasters

<table>
<thead>
<tr>
<th>BSC</th>
<th>Music Bird</th>
<th>JNF</th>
<th>St.Giga</th>
</tr>
</thead>
</table>

**MITSUBISHI ELECTRIC CORPORATION**
### SI/EPG For Digital Broadcasting Receiver

#### Data Broadcasters (TV Broadcasters)

<table>
<thead>
<tr>
<th>NHK</th>
<th>BS Nittere</th>
<th>BS ASAHI</th>
<th>BS-I</th>
</tr>
</thead>
<tbody>
<tr>
<td>BS JAPAN</td>
<td>BS FUJI</td>
<td>WOWOW</td>
<td>Star channel</td>
</tr>
</tbody>
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#### Data Broadcasters (Audio Broadcasters)

<table>
<thead>
<tr>
<th>BSC</th>
<th>Music Bird</th>
<th>JNF</th>
<th>St.Giga</th>
</tr>
</thead>
</table>

#### Data Broadcasters

<table>
<thead>
<tr>
<th>Megaport</th>
<th>Weather News</th>
<th>Digital Cast International</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nippon Data</td>
<td>BS955</td>
<td>Nippon Media Ark</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nippon BS</td>
</tr>
</tbody>
</table>

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