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Strata CTX IP Telephone Programming Guidelines

This bulletin contains excerpts from the *CTX Programming Manual* Appendix A – Applications, Tips and Tricks. The excerpts contain the basic CTX IP Setup using WinAdmin; IPT1020-SD Telephone Network Settings; IP Telephone Quality of Service (QoS) Programming; and Echo Cancellation and Volume Level Adjustments.

CTX IP Telephone Programming Guidelines

Use the following guidelines to program your CTX IP Telephone.

Basic CTX IP Setup Using WinAdmin

1. Select System > Card Assignments (Program 100) to set the BIUP-M1A PCBs in the appropriate slots.

BIPU-M1A can only be installed in 16 channel card slots:

CTX100 slots 1~8; CTX670 Base slots 1~8; and CTX670 Expansion slots 1~6

Note If the CTX is initialized (Program 900-01) after the BIPU-M1A is installed, the CTX assigns the BIPU-1MA, code 021, to the appropriate card slots automatically.

2. Select IP Telephone > BIPU Configuration (Program 151) to set BIPU-M1A IP address (check with the Network Administrator for IP Address, subnet mask, etc.). The BIPU version number will be displayed when the BIPU is operating and is connected on the same network as WinAdmin PC.

Note If the CTX is initialized (Program 900-01) after the BIPU-M1A is installed, the CTX assigns the BIPU-1MA default parameters as shown in Table 1-6 on page 1-5.

3. Select Station > Assignments > Basic to assign PDNs to IP telephones (BIPU equipment numbers) if this was not done during CTX system initialization. The WinAdmin PDN Range wizard can also be used to assign PDNs to the BIPU channels.

Note Currently IPT PDNs are listed as DKT, they will be listed as IPT in a future version of WinAdmin. IP telephones are programmed exactly like DKTs, so any Program command used for DKTs can be used for IPTs.

4. Select IP Telephone > Station IP Data (Program 250). Set "05 Station Terminal Authentication Mode" to apply if the PDN assigned to a particular IP Telephone should be linked (reserved for) to that telephone's MAC address. Each telephone has a unique hard coded MAC address. This prevents other IP telephones from using the reserved PDN when an IP telephone is moved.

Note If IPT Authentication is applied/not applied in Program 250-05, it will override the IPT Authentication setting in Program 150-02.

5. If multiple CTX systems with BIPU-M1As are connected to the IP network, Select IP Telephone > System IP Data (Program 150), and set "09 IP CTX Identifier."

Enter a CTX Node identifier if more than one CTX Node is on the IP Network. This can be the same as the Qsig Network Node ID used for this system if it is in a CTX Qsig. Network - but the two IDs are not related in software logic.

This ID must match the Node number programmed in the IP telephone using 369Hold-2, FB06 6.

6. Run all other CTX programs necessary to customize the features required for each IP Telephone. All programs used to program Digital Telephones also apply to IP Telephones (Program 205 keystrips, 213 Add-on-Modules, Program 204 DKT Parameters, etc.).

IP Telephone Installation and Network Connection setup

1. Install the IP telephones using instructions in the IPT chapter of the *CTX Installation and Maintenance manual*.
2. From each IP Telephone, set its network connection parameters using the “369Hold” program mode (refer to the instructions that follow).

Notes

- Some IP telephones parameters must be set from each individual IPT using “369Hold” programming. These parameters remain stored in the IP telephone even if the telephone is unplugged. This allows the telephone to be moved to different locations without reprogramming.
- Other IPT parameters must be set in IP Telephone > Station IP data (Program 250) in WinAdmin. Initially, the parameters in WinAdmin are normally kept at defaults.

IPT1020-SD Telephone Network Settings

This section explains how to enter data for your IPT1020-SD telephone. Before you begin, make sure that you have the following information: IP address, subnet mask number, router address, Station ID, CTX Strata Net node number, IP address for the BIPU-M1A, etc.

Notes

You may want to enter a period or backspace when performing the following steps. While in programming mode [Press **3+6+9+Hold** (simultaneously) to enter programming mode], you can use these buttons for the following functions:

- Press ***** to enter a period.
- Press **Vol ▼** to backspace.
- Press **Spkr** to cancel entry and start over.

IPT-to-IP Network Connection Instructions

1. Press **3+6+9+Hold** (simultaneously).
 2. Press **2**, then press **Hold** to select the Network Setting Mode.
 3. Press **FB1** to see if the DHCP server is in use or not. Press one of the following:
 - 1**: manual setting, then press **Hold**.
 - 2**: auto setting by DHCP server, then press **Hold**.
 4. If Step 3 above is set for manual setting, then press **FB2**. Enter the IP address for this IPT and press **Hold**. To enter the period in an IP address, press the ***** button on your dialpad (e.g., if the IP address is “192.168.1.241,” press **192*168*1*241**).
 5. Press **FB3**. Enter the subnet mask number and press **Hold**. (e.g., if the subnet mask address is “255.255.255.0,” press **255*255*255*0**).
 6. If the IPT is connected to a router or other gateway device and if Step 3 above is set for manual setting, then press **FB4**. Enter the router address, then press **Hold**.
 7. Press **FB5**. Enter a Station ID for the IPT and press **Hold**. This is usually your telephone’s primary number (PDN), which must be set in CTX Program 200.
 8. Press **FB6** to enter the node number of the CTX node that contains the BIPU-M1A to which this IPT interfaces, then press **Hold**. This FB setting is for CTX networked systems only. This node number must match the IP CTX Identifier number set in Program 150-09.
 9. Press **FB11** for BIPU IP address mode. Press one of the following:
 - 1**: manual setting, then press **Hold**. Press **FB12** and enter the BIPU IP address, then press **Hold**. (e.g., if the BIPU IP address is “192.168.1.241,” enter it in this format **192*168*1*241**).
 - 2**: auto setting by broadcast, then press **Hold**.
 - 3**: auto setting by multicast (IPT doesn’t support multicast setting in this first release), then press **Hold**. Press **Hold** again to set all the above data.
 10. Go off-hook and hang up. The IPT will search for the BIPU-M1A, initialize and then set the IP address (from 20 sec. to 60 sec.). Time, Date and PDN displays on LCD when the information is set.
- Note** See “IP Telephone Start Up Sequence” below for an explanation of the LCDs that you will see during this procedure.

IP Telephone Start Up Sequence

After the IP telephone network setting has been programmed, the following displays occur after the IP telephone is hung-up:

Action	LCD Indication	Remarks
1. IPT initializes.	INITIALIZING PLEASE WAIT	
2. IPT searches for IP address.	IPADDRESS SETTING...	<p>Possible errors:</p> <ul style="list-style-type: none"> IP address is not set. IPADDRESS SETTING... CAN'T SET IPADDRESS No DHCP server, etc. <p>If error occurs, IP address setting is carried out continuously.</p>
3. IPT searches for BIPU.	SEARCHING BIPU	<p>Retries every 10 seconds.</p> <p>Possible errors:</p> <ul style="list-style-type: none"> BIPU is not found "time out." SEARCHING BIPU BIPU NOT FOUND BIPU is not found (Station ID automatic setting). SEARCHING BIPU CAN'T GET STATIONID BIPU is not found (StationID manual setting) SEARCHING BIPU STATION ID UNMATCH Multicast address is not registered (BIPU IP address setting mode is automatic setting by multicast) NOT EXIST MULTICAST ADDR BIPU IP address is not registered (BIPU IP address setting mode is manual setting). NOT EXIST BIPU ADDRESS
4. Registering to BIPU	REGISTERING IPT...	<p>When registering fails, IPT retries by starting at Step 2 again.</p> <p>Error message: REGISTERING IPT... CAN'T REGISTER IPT:EXXX</p> <p>"Exxx" is error number.</p>
5. Registering completion - normal action.	<p>LCD data is indicated from CTX. Example:</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p style="text-align: center;">NO. 205 THURSDAY</p> <p style="text-align: center;">FEB 28</p> </div>	

Viewing IPT1020-SD Terminal Information

1. Press **3+6+9+Hold** (simultaneously).
2. Press **1**, then press **Hold**.
3. Press **FB1** to view IPT firmware version (application and boot versions, read only).
4. Press **FB2** to view IPT MAC address (read only).
5. Go off-hook and hang up.

Initializing the IPT1020-SD (Optional)

CAUTION! If you initialize, the IP telephone network settings return to default.

1. Press **3+6+9+Hold** (simultaneously).
2. Press **Vol ▲+Hold**.
3. Press **FB03** to initialize the telephone's IP network connection settings (LED On = initialize, LED Off = don't initialize). See "IPT-to-IP Network Connection Instructions" below for details.
4. Press **Hold** again to complete the initialization process.
5. Go off-hook and hang up.

IP Telephone Quality of Service (QoS) Programming

Deploying many IP telephones on a data LAN can have some unexpected pitfalls if the network does not have the bandwidth and speed required to handle VoIP traffic. To prevent delay, jitter, and data loss for VoIP traffic and retain the performance of your other business-critical network applications a network Voice Readiness Assessment should be completed before installing VoIP.

Important! *Voice Readiness Assessments are the responsibility of the installing TSD dealer. Toshiba is not responsible for supporting problems which occur because the network on which the IP telephones are installed does not meet VoIP packet requirements.*

CTX IP provides a number of adjustable tuning parameters dealing with sharing of network resources, collectively referred to as Quality of Service (QoS). Some CTX IP voice quality and packet priority parameters that can be adjusted are described below:

General QoS Adjustments

The CTX provides parameters that can be adjusted to improve IP voice quality. These are normally kept at default but may be adjusted as necessary to modify IP voice quality. Set each item individually and then test for voice quality improvements each time a parameter is changed.

1. In WinAdmin, select IP Telephone > Station IP Data (Program 250) “08 Audio Codec” and select the codec that should be enabled for individual IP telephones. The G711 provides the best voice quality but requires the most network bandwidth. Usually G.729A is used when IP telephones are connected remotely.
2. In WinAdmin, select IP Telephone > System IP data (Program 150) and select the 11 BIPU/IPT VQ mode setting.
3. You can assign a Voice Packet Table to individual IP telephones in IP Telephone > Station IP Data (Program 250-07) Voice Packet Table. In WinAdmin, select IP Telephone > Voice Packet Configuration (Program 152) and configure up to 256 different tables (see below).

Voice Packet Configuration Table (Program 152)

Normally the default table settings are used. If experiencing voice quality problems, set each item individually and then test for voice quality improvements each time a parameter is changed. The default settings are shown below. The tables in this program must be assigned to individual IP telephones in IP Telephone > Station IP Data (Program 250) for them to be used by the CTX.

Voice Packet Configuration Parameters defaults:

- Voice Packet Transmission Interval – 20 msec
- Jitter buffer type – adaptive
- Jitter buffer length – 100 (smooth out packet playback)
- Maximum acceptable delay – 200 (not adjustable in CTX R2.0)
- Packet loss threshold – 5
- Packet loss ratio – 5 (not adjustable in CTX R2.0).
- Measurement period – 1000 (not adjustable in CTX R2.0).

Priority Control Adjustments

This VoIP feature provides a framework in which voice traffic flowing on the network is prioritized over other types of traffic. CTX supports two industry standard types of Priority control: IEEE802.1p and Diffserv (Differentiated Services). These options should be enabled simultaneously so the voice packets remain prioritized through the whole network path. IEEE802.1p prioritizes voice packets on the Ethernet (LAN) level and DiffServ prioritizes voice packets that pass through the internet, intranet, etc.

Important! *Priority Control processing has two requirements for it to work accurately. All network Ethernet equipment connected to the BIPU LAN (routers, switches, etc.) must be in compliance with IEEE802.1p voice packet prioritization. When going through a network provider (ISP, etc.), the provider must support the DiffServ feature - contact your ISP for this service.*

► To setup priority control from WinAdmin

1. Select IP Telephone > System IP Data
2. For Ethernet level (LAN) voice packet priority control.
Enable 07 IEEE802.1p
Set 08 IEEE802.1p. Configuration and set “voice” or “best effort”, voice provides a higher level of priority.
3. For IP level (Internet) voice packet priority control.
Enable 03 DiffServ
Set 04 TOS Field Type (TOS -Type Of Service or DSCP - Differentiated Service code point)

Note The most common type used is TOS

If set to “TOS”

Set 05 “TOS Precedence type” (CRITIC/ECP ~ Routine) where CRITIC has the highest priority.

Set “TOS Delay type” (Normal or Low) - Low is the best service setting

Set “TOS Throughput” (Normal or High) - High is the best service setting

Set “TOS Reliability” (Normal or High) - High is the best service setting

IF set to “DSCP”

Set “06 DSCP” from 1~64, Basic setting should be one of the following:

0 = Best effort, The default setting for most IP traffic.

24 = Assured flow (AF) or Controlled Load, intended to classify streaming traffic.

40 = Expedited Flow (EF) or Guaranteed, intended to classify high priority traffic. Used by VoIP gateways to mark VoIP traffic.

Echo Cancellation and Volume Level Adjustments

Dealing with Echo Problems in General

The first step in isolating echo problems is to find the source. Usually only one party hears echo. If that's the case, the echo source is the far end – if you hear echo, it is coming from the other party's side.

Example: if your local gateway is causing echo, you will not hear it because there is no delay in signals that may bounce back to you. However, as the echo causing gateway is moved further away, echo becomes more noticeable because the delay in the sound that is returned increases. Once you find out which end of the network is causing the echo, check for devices such as cheap headsets or conference telephones – these devices allow the earphone or speaker output to be feed back into the microphone to cause echo. Other devices that cause echo are two-wire to four-wire converters and digital-to-analog gateways.

Echo Caused by Older CTX Analog PCBs

To provide optimum voice quality of IP telephones on Strata CTX systems, there are some compatibility requirements that need to be followed when using analog CO line cards in the system.

- It is highly recommended to only use RCOU3A, RCOS3A, REMU1A (four-wire, not two-wire), RDDU2A, and RGLU3A analog CO line interfaces in IP telephone applications. These PCBs provide optimum speech quality for IPT1020-SD IP telephone connections.
- Do not use RCOU1A, RCOS1A, REMU1A (two-wire), RDDU1A, RGLU1A, or RGLU2A analog CO line interfaces in IP telephone applications. These PCBs will work but will cause IP telephone users to experience unacceptable voice quality and echo return loss.

Echo Reduction Adjustments

The items listed below can be adjusted to help eliminate echo. The below items will need to be tweaked, case by case with trial and error, for each situation.

1. In WinAdmin, select IP Telephone > System IP data (Program 150-10); use “Tail length of Echo Canceller” (set to different options and test).
2. In WinAdmin, select System > PAD table (Program 107) pad table; use IPT selection and reduce the volume (increase Net Loss) to reduce the echo. This setting is a compromise between the acceptable echo and volume loss levels (set to different options and test).
3. The IP telephone user taps the telephone Vol key (up or down), while on a call to cancel echo on a call-by-call basis.
4. If using a Headset, the user can adjust the IP Telephone headset transmit volume level. In some cases, lowering the headset transmit level can reduce echo.

Setting the IPT1020-SD Headset Transmit Volume

1. Press **3+6+9+Hold** (simultaneously).
2. Press **#**.
3. Press the Feature Buttons to turn the LEDs On/Off for the desired volume transmission level (see Table A-1).

Table A-1 Volume Level Transmitted from Headset Microphone

LEDS			Transmit Level
FB3	FB2	FB1	
ON	ON	ON	Level 7 (max.)
ON	ON	OFF	Level 6
ON	OFF	ON	Level 5
ON	OFF	OFF	Level 4
OFF	ON	ON	Level 3 (initial value)
OFF	ON	OFF	Level 2
OFF	OFF	ON	Level 1
OFF	OFF	OFF	Level 0 (min.)

4. Press FB4 for handset voice output in speakerphone mode (LED On = with, LED Off = without).
5. Press **Hold** to set the above data.
6. Go off-hook and hang up.