radio signals being communicated from base station transceiver **24** to antenna unit **18** via radio signal wires **42** and **40**. The path of the radio signals transmitted from base station transceiver **24** may be split at smart antenna apparatus **16** such that one path is used to synchronize smart antenna apparatus **16** with base station transceiver **24** and another path continues to, and is transmitted by, antenna unit **18** in order to synchronize mobile stations **15** with base station transceiver **24**.

[0085] In this manner, smart antenna apparatus **16** may be synchronized accurately with base station transceiver **24** using the radio signals communicated from base station transceiver **24** via radio signal wires **40**. Thus, in some embodiments, the components of base station system **12**, including base station transceiver **24**, do not need to be modified, altered, or reconfigured in order for smart antenna apparatus **16** to be synchronized with, and maintained in synchronization with, base station transceiver **24**. In one embodiment, smart antenna apparatus **16** may be synchronized accurately with base station transceiver **24** using only signals received from base station transceiver **24** via radio signal wires **42**. Thus, the cost and labor of modifying or altering base station system **12** and/or dealing or negotiating with the manufacturer of the components of base station system **12**, such as base station transceiver **24**, is reduced or, in some embodiments, eliminated.

[0086] In addition, smart antenna apparatus **16** may be synchronized accurately with base station transceiver **24** without interfering with the radio signals being communicated from base station transceiver **24** and intended for mobile stations **15**. This is accomplished by splitting the path of the radio signals communicated from base station transceiver **24** into a first path directed toward antenna unit **18** for synchronizing mobile stations **15** and a second path directed toward a smart antenna receiver and processor for synchronizing smart antenna apparatus **16**, as discussed below in greater detail.

[0087] FIG. **5** illustrates an embodiment of a base station transceiver **24**, a smart antenna apparatus **16**, and an antenna unit **18** for synchronizing smart antenna apparatus **16** with base station transceiver **24**. Smart antenna apparatus **16** includes a radio wire input **64**, a splitter **50**, control channel monitoring module **104**, and processing module **62**. Radio wire input **64** is operable to be coupled to one or more radio signal wires **42** to receive radio signals communicated from base station transceiver **24**. In particular, radio wire input **64** may be operable to receive signals communicated in a control channel, including control signals communicated within the control channel.

[0088] Splitter **50** is operable to split the path of a signal into two or more paths. For example, splitter **50** may be a bidirectional or a tri-directional coupler. In the embodiment shown in FIG. **5**, splitter **50** is a bidirectional coupler operable to divide an input path **66** of radio signals received from radio wire input **64** into a first output path **68** directed toward antenna unit **18** and a second output path **70** directed toward first filter **52**. Like input path **66**, output paths **68** and **70** may be operable to communicate signals received by radio wire input **64**. In addition, splitter **50** may be operable to divide signal path **66** without interfering with signals communicated from signal path **66** to signal path **68**. Thus, control channel monitoring module **104** may be operable to passively monitor, or receive, the control signals being communicated from base station transceiver **24** to antenna unit **40**. For example, the control signals may be monitored without using active components. In one embodiment, the control signals being communicated from base station transceiver **24** to antenna unit **40** are monitored without amplifying the control signals.

[0089] In the embodiment shown in FIG. **5**, control channel monitoring module **104** comprises a first filter **52**, a signal mixer **54**, a second filter **56**, a receiver **58**, and a sampler **60**. First filter **52** may include an attenuator **72** and a bandpass filter **74**. Attenuator **72** is operable to reduce the amplitude of radio signals by a predetermined amount without introducing distortion to the signals. Bandpass filter **74** allows a specific band of frequencies to pass through while blocking or absorbing other frequencies outside the specified band. In one embodiment, bandpass filter **74** allows the band of frequencies defined by the downlink control frequency to pass through, while blocking or absorbing other frequencies.

[0090] Signal mixer **54** is operable to mix, or combine, the signals received from first filter **52** with a conversion signal **76** in order to convert the signals from one frequency to another frequency (in other words, from one frequency band to another frequency band). Signal mixer **54** may be operable to convert the signals from the downlink frequency at which the signals were transmitted from base station transceiver **24** to the corresponding uplink frequency at which the signal may be received by receiver **58**. For example, as discussed above, in the P/E/R-GSM 900 standard, downlink frequencies are offset from their corresponding uplink frequencies by 45 MHz. Thus, as shown in FIG. **2**, conversion signal **76** may be approximately a 45 MHz signal such that signal mixer **54** is operable to convert the signal from a downlink frequency to an uplink frequency which may be received by receiver **58**. It should be understood that in some embodiments, conversion signal **76** is defined according to the offset between downlink frequencies and corresponding uplink frequencies according to the particular communication environment. For example, in a GSM 850 environment, as in the P/E/R-GSM 900 environment, conversion signal **76** may be approximately a 45 MHz signal. In a GSM 1900 environment, conversion signal **76** may be approximately an 80 MHz signal. In a GSM 1800 environment, conversion signal **76** may be approximately a 95 MHz signal. In a GSM 480/450 environment, conversion signal **76** may be approximately a 10 MHz signal.

[0091] Second filter **56** may include a receiving frequency bandpass filter **78** and an attenuator **80**. Like bandpass filter **74**, bandpass filter **78** allows a specific band of frequencies to pass through while blocking or absorbing other frequencies outside the specified band. In one embodiment, bandpass filter **78** allows the band of frequencies defined by the corresponding uplink frequency to pass through, while blocking or absorbing other frequencies. Like attenuator **72**, attenuator **80** is operable to reduce the amplitude of radio signals by a predetermined amount without introducing distortion to the signals.

[0092] Receiver **58** is operable to receive signals from second filter **56** and is generally operable to receive radio signals within a particular frequency band. In one embodiment, receiver **58** is operable to receive signals within the